

PRELIMINARY DATA SUMMARY

March 1986

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility in Duck, North Carolina. The data were collected and the analyses performed by the FRF staff. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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I. INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Fig.1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The FRF consists of a 561-m (1,840 ft) long concrete research pier supported on 0.91 m (3 ft) diameter steel piles. The pier deck is 6.1 m (20 ft) wide, 7.74 m (25.4 ft) above mean sea level (MSL), and extends from behind the dunes to approximately the 7.6 m (25 ft) depth contour. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Most of the data are daily observations or the results of preliminary data analysis. In many instances, continuous analog records and more extensive analyses will be made available later by the CERC Coastal Engineering Information and Analysis Center (CEIAC).

Table 1 is a list of instruments used, their status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depth at the wave gages and current meters vary and may best be determined from the information contained in Figure 8. Other installation information is contained in Table 1. All times unless otherwise specified are referenced to Eastern Standard Time (EST).

Section II presents the meteorological data; Sections III through VI, oceanographic data; Section VII, nearshore profiles and bathymetry; and Section VIII, if included, documents special events that occurred at the FRF during the month.

Questions and/or comments concerning the data may be directed to Mr. Herman C. Miller at (919) 261-3511.

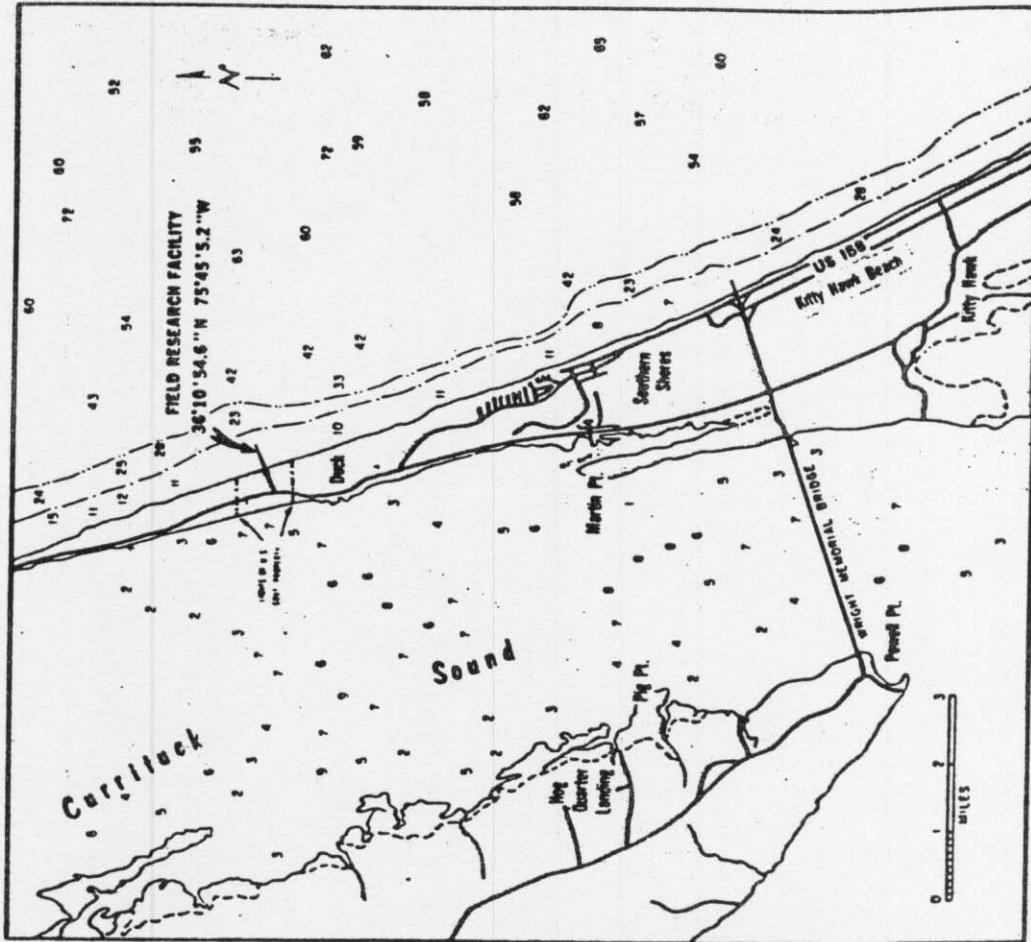
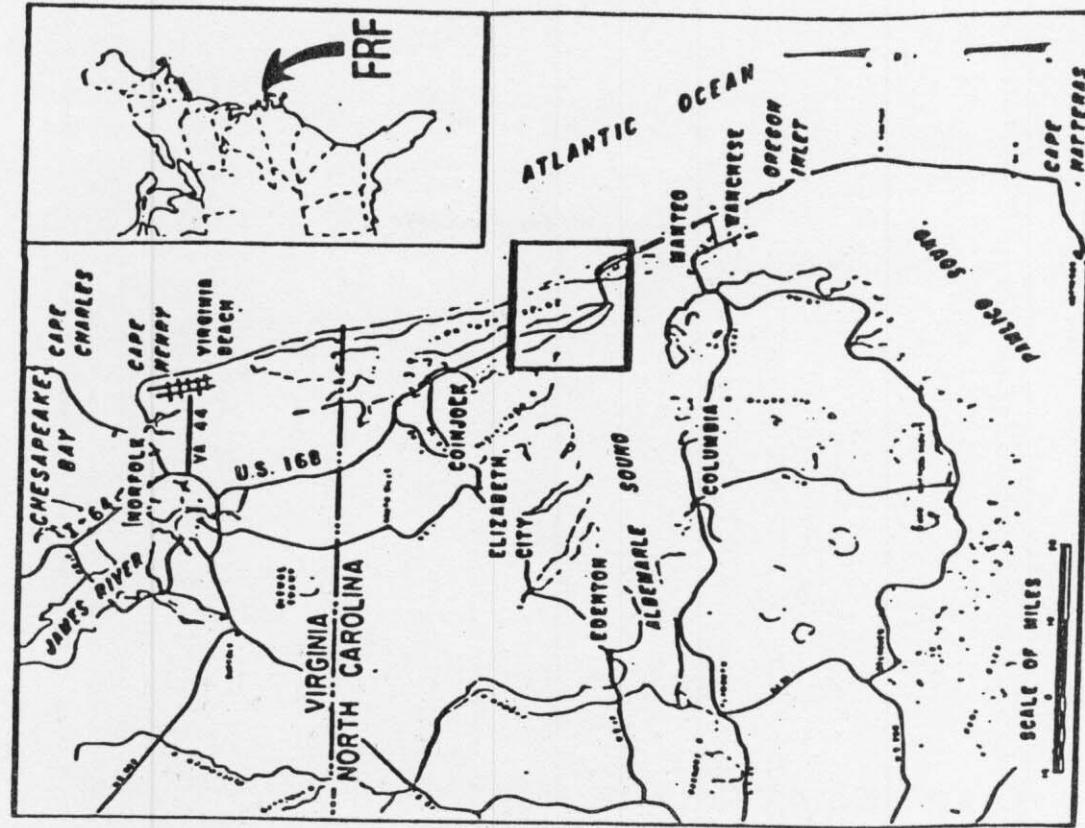


Figure 1. FRF Location Map

TABLE 1
Instrument Status/Data Availability
March 1986

| GAGE NUMBER | DESCRIPTION/REMARKS | DEPTH AT SENSOR | DAY OF THE MONTH | | | | | | | | | | | | | | | | |
|---|--|----------------------------------|---|-------------------|----------------|---------------|-------------------|----------------|---------------|-------------------|----------------|---------------|-------------------|----------------|---------------|-------------------|----------------|-------------------|----------------|
| | | | 1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31 | Instrument Status | Data Collected | Analog Record | Instrument Status | Data Collected | Analog Record | Instrument Status | Data Collected | Analog Record | Instrument Status | Data Collected | Analog Record | Instrument Status | Data Collected | Instrument Status | Data Collected |
| | Barometric Pressure | | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| Precipitation | | | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| Air Temperature | | | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| Anemometer on Lab Blg - Elevation 19a (MSL) | Bayler staff located at station 7480 on FRP pier | See profile | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| 645 | Baylor staff located at station 19+00 on FRP pier | See profile | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| 623 | Waverider buoy located 1.0 km from shore | Approx. 8.5 m. MSL | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| 640 | Waverider buoy located 6.0km from shore | Approx. 18 m. MSL | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| 630 | Current meter at station 14+20 on FRP pier | See profile | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| 639 | Current meter 500m south (0.3 km offshore) | Approx. 6 m MSL | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |
| 679 | NOAA primary tide station located at seaward end of FRP pier | Instrument Status Data Collected | | ▼ | ▼ | ▼ | | | | | | | | | | | | | |

Instrument Status: Operational - Daily Observation: YES
 Data Collected: ALL , SOME

Analog Record: ALL , PARTIAL
 Preliminary Analysis: ALL , SOME

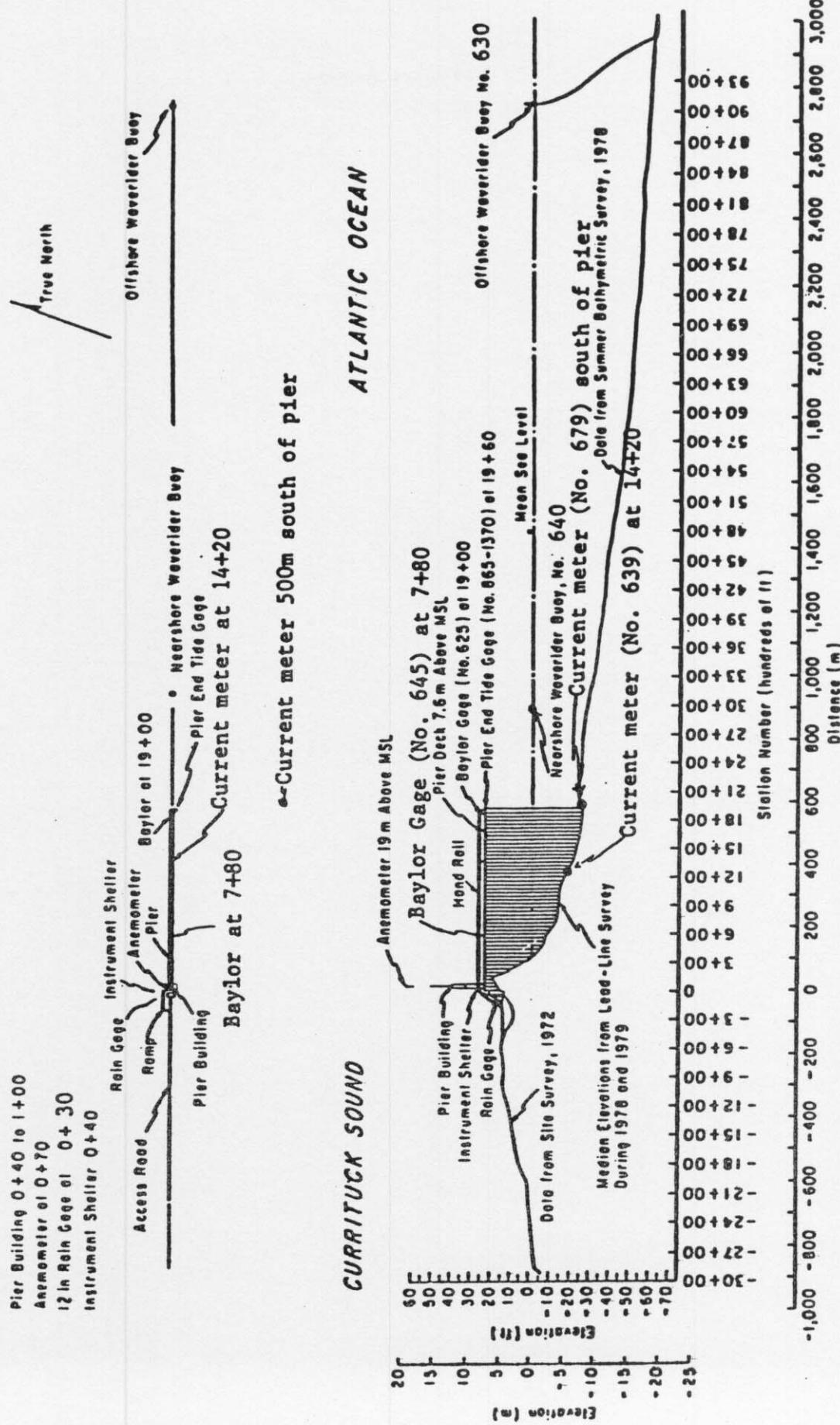


Figure 2. Instrument locations at FRP.

II. METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Fig. 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Data General NOVA-4 computer. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

The wind measurements are obtained from a Weather Measure Skyvane located on the FRF laboratory building (Fig. 2), 19.1 m above mean sea level (MSL).

The high and low temperatures are obtained from daily readings of NWS maximum and minimum thermometers and represent the extreme temperature values since the last reading.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in) -
 $mm \times .03937 = in$
2. Millibars (mb) to inches of mercury (in Hg) -
 $mb \times 0.02953 = in Hg$
3. Degrees Celcius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

TABLE 2: METEOROLOGICAL DATA

PART 1

MARCH 1986

| DAY | HOUR | WIND SPEED (M/S) | WIND DIRECTION (DEG TN) | TEMPERATURE (DEG C) | ATM PRESSURE (MB) | PRECIPITATION (MM) |
|-----|------|---------------------|----------------------------|------------------------|----------------------|-----------------------|
| 1 | 100 | 9 | 10 | 2.5 | 1015.0 | 0 |
| | 700 | 12 | 19 | 1.6 | 1015.3 | 0 |
| | 1300 | 12 | 1 | 1.7 | 1013.1 | 0 |
| | 1900 | 10 | 349 | 2.0 | 1010.9 | 0 |
| 2 | 100 | 6 | 331 | 1.4 | 1011.5 | 0 |
| | 700 | 6 | 322 | .5 | 1014.7 | 0 |
| | 1300 | 4 | 24 | 4.1 | 1015.8 | 0 |
| | 1900 | 3 | 335 | 2.7 | 1016.1 | 0 |
| 3 | 100 | 3 | 196 | 3.2 | 1016.5 | 0 |
| | 700 | 4 | 182 | 5.3 | 1015.8 | 0 |
| | 1300 | 5 | 143 | 6.9 | 1013.8 | 0 |
| | 1900 | | Software crash | | 1012.1 | 0 |
| 4 | 100 | 3 | 289 | 3.2 | 1014.5 | 0 |
| | 700 | 3 | 326 | 3.6 | 1014.1 | 0 |
| | 1300 | 4 | 20 | 6.3 | 1012.8 | 0 |
| | 1900 | 3 | 345 | 5.3 | 1013.1 | 0 |
| 5 | 100 | 3 | 305 | 4.5 | 1012.4 | 0 |
| | 700 | 4 | 324 | 4.7 | 1013.1 | 0 |
| | 1300 | 7 | 3 | 8.0 | 1014.0 | 0 |
| | 1900 | 2 | 133 | 5.0 | 1015.1 | 0 |
| 6 | 100 | 4 | 157 | 4.6 | 1014.4 | 0 |
| | 700 | | Disk crash | | 1011.1 | 0 |
| | 1300 | | | | 1003.6 | 0 |
| | 1900 | 10 | 279 | 10.0 | 1003.6 | 0 |
| 7 | 100 | 10 | 272 | 5.9 | 1008.5 | 0 |
| | 700 | 8 | 238 | 5.8 | 1009.3 | 0 |
| | 1300 | 11 | 15 | 6.4 | 1009.0 | 0 |
| | 1900 | 11 | 12 | 3.1 | 1014.5 | 0 |
| 8 | 100 | 9 | 336 | -2.7 | 1023.0 | 0 |
| | 700 | 7 | 334 | -4.8 | 1028.8 | 0 |
| | 1300 | 6 | 3 | -.3 | 1030.7 | 0 |
| | 1900 | 2 | 84 | -.8 | 1030.8 | 0 |
| 9 | 100 | 5 | 199 | -.5 | 1031.2 | 0 |
| | 700 | 4 | 195 | 3.3 | 1029.2 | 0 |
| | 1300 | 5 | 226 | 12.5 | 1025.5 | 0 |
| | 1900 | 7 | 203 | 11.7 | 1023.5 | 0 |
| 10 | 100 | 6 | 219 | 10.3 | 1023.6 | 0 |
| | 700 | 6 | 217 | 11.1 | 1023.6 | 0 |
| | 1300 | 6 | 201 | 20.4 | 1020.9 | 0 |
| | 1900 | 7 | 195 | 15.3 | 1018.2 | 0 |
| 11 | 100 | 7 | 198 | 14.7 | 1014.8 | 0 |
| | 700 | 7 | 196 | 15.9 | 1012.1 | 0 |
| | 1300 | 4 | 235 | 20.6 | 1010.4 | 0 |
| | 1900 | 10 | 9 | 9.7 | 1014.4 | 0 |
| 12 | 100 | 6 | 22 | 7.0 | 1019.9 | 0 |
| | 700 | 8 | 17 | 6.6 | 1021.6 | 0 |
| | 1300 | 7 | 2 | 7.7 | 1020.2 | 0 |
| | 1900 | 5 | 1 | 7.5 | 1021.2 | 0 |
| 13 | 100 | 1 | 37 | 7.6 | 1020.9 | 0 |
| | 700 | 1 | 131 | 8.8 | 1020.5 | 0 |
| | 1300 | 5 | 190 | 23.9 | 1018.5 | 0 |
| | 1900 | 7 | 181 | 19.8 | 1017.5 | 0 |
| 14 | 100 | 4 | 182 | 18.6 | 1017.8 | 0 |
| | 700 | 6 | 174 | 18.8 | 1016.1 | 0 |
| | 1300 | 8 | 170 | 21.6 | 1010.7 | 0 |
| | 1900 | 7 | 187 | 17.6 | 1004.3 | 18 |
| 15 | 100 | 11 | 235 | 16.6 | 1006.0 | 0 |
| | 700 | 5 | 239 | 13.8 | 1012.4 | 0 |
| | 1300 | 3 | 150 | 14.5 | 1013.4 | 0 |
| | 1900 | 3 | 193 | 14.7 | 1011.7 | 0 |
| 16 | 100 | 5 | 247 | 13.3 | 1011.1 | 0 |
| | 700 | 3 | 346 | 9.6 | 1012.8 | 0 |
| | 1300 | 4 | 1 | 11.6 | 1014.4 | 0 |
| | 1900 | 2 | 84 | 8.7 | 1015.1 | 0 |

TABLE 2: METEOROLOGICAL DATA

PART 2

MARCH 1986

| | | WIND SPEED | WIND DIRECTION (DEG TN) | TEMPERATURE (DEG C) | ATM PRESSURE (MB) | PRECIPITATION (MM) |
|-----|------------|----------------|-------------------------------|------------------------|-------------------------|-----------------------|
| DAY | HOUR (M/S) | | | | | |
| 17 | 100 | 9 | 33 | 8.0 | 1016.8 | 0 |
| | 700 | 8 | 33 | 7.7 | 1020.2 | 0 |
| | 1300 | 7 | 0 | 9.5 | 1021.6 | 0 |
| | 1900 | 5 | 42 | 7.5 | 1022.2 | 0 |
| 18 | 100 | 4 | 47 | 7.6 | 1023.9 | 0 |
| | 700 | 3 | 61 | 8.2 | 1025.6 | 0 |
| | 1300 | 0 | | 11.0 | 1026.0 | 0 |
| | 1900 | 5 | 134 | 10.0 | 1022.9 | 0 |
| 19 | 100 | 7 | 167 | 16.8 | 1018.8 | 0 |
| | 700 | 6 | 192 | 17.5 | 1016.1 | 0 |
| | 1300 | 13 | 211 | 21.0 | 1011.7 | 0 |
| | 1900 | | | | 1008.0 | 0 |
| 20 | 100 | Operator error | | | 1007.7 | 0 |
| | 700 | 5 | 334 | 14.7 | 1012.8 | 0 |
| | 1300 | 4 | 18 | 8.8 | 1015.5 | 0 |
| | 1900 | 11 | 31 | 6.5 | 1017.8 | 4 |
| 21 | 100 | 11 | 34 | 5.4 | 1020.2 | 0 |
| | 700 | 15 | 22 | 2.5 | 1024.9 | 0 |
| | 1300 | 13 | 14 | -2 | 1028.0 | 0 |
| | 1900 | 12 | 22 | 1.2 | 1028.3 | 4 |
| 22 | 100 | 14 | 14 | 1.5 | 1028.7 | 12 |
| | 700 | 14 | 17 | 2.1 | 1030.0 | 0 |
| | 1300 | 12 | 18 | 4.3 | 1030.7 | 0 |
| | 1900 | 8 | 11 | 3.6 | 1031.4 | 0 |
| 23 | 100 | 9 | 9 | 3.9 | 1030.4 | 0 |
| | 700 | 8 | 21 | 5.0 | 1030.4 | 0 |
| | 1300 | 5 | 5 | 8.3 | 1028.7 | 0 |
| | 1900 | 0 | | 6.4 | 1152.9 | 0 |
| 24 | 100 | 4 | 214 | 7.8 | 1026.3 | 0 |
| | 700 | 4 | 280 | 8.8 | 1027.7 | 0 |
| | 1300 | 4 | 54 | 13.6 | 1031.0 | 0 |
| | 1900 | 6 | 71 | 8.8 | 1034.8 | 0 |
| 25 | 100 | 4 | 54 | 8.1 | 1037.1 | 0 |
| | 700 | 3 | 51 | 9.2 | 1038.5 | 0 |
| | 1300 | 0 | | 14.8 | 1038.5 | 0 |
| | 1900 | 3 | 143 | 11.8 | 1035.8 | 0 |
| 26 | 100 | 0 | | 12.5 | 1035.1 | 0 |
| | 700 | 0 | | 11.0 | 1033.7 | 0 |
| | 1300 | 0 | | 16.0 | 1030.4 | 0 |
| | 1900 | 4 | 182 | 17.3 | 1026.6 | 0 |
| 27 | 100 | 4 | 197 | 14.3 | 1024.3 | 0 |
| | 700 | 2 | 225 | 14.0 | 1021.9 | 0 |
| | 1300 | 5 | 279 | 20.7 | 1018.5 | 0 |
| | 1900 | 4 | 34 | 11.4 | 1019.5 | 0 |
| 28 | 100 | 11 | 8 | 10.9 | 1022.9 | 0 |
| | 700 | 9 | 25 | 8.4 | 1026.6 | 0 |
| | 1300 | 5 | 285 | 9.7 | 1027.0 | 0 |
| | 1900 | 4 | 134 | 8.2 | 1027.3 | 0 |
| 29 | 100 | 0 | | 6.4 | 1027.0 | 0 |
| | 700 | 1 | 32 | 10.8 | 1028.0 | 0 |
| | 1300 | 0 | | 14.2 | 1027.0 | 0 |
| | 1900 | 4 | 136 | 11.1 | 1024.9 | 0 |
| 30 | 100 | 1 | 200 | 12.3 | 1023.9 | 0 |
| | 700 | 0 | | 12.8 | 1023.9 | 0 |
| | 1300 | 5 | 151 | 15.9 | 1021.9 | 0 |
| | 1900 | 3 | 181 | 17.1 | 1019.5 | 0 |
| 31 | 100 | 5 | 223 | 14.5 | 1019.9 | 0 |
| | 700 | 5 | 223 | 15.0 | 1019.9 | 0 |
| | 1300 | 0 | | 22.3 | 1020.2 | 0 |
| | 1900 | 4 | 14 | 12.9 | 1021.2 | 0 |

III. WAVE DATA

Wave data were collected from two Baylor staff gages (CERC gage Nos. 625 and 645) and Waverider buoys (CERC gage Nos. 630 and 640, Table 1 and Figure 2). The data were collected, analyzed, and stored on magnetic tape using a Data General NOVA-4 computer.

The NOVA-4 is programmed to sample the wave gages every 6 hours near 0100, 0700, 1300, and 1900 EST at a sampling rate of four times per second, collecting data in 20- minute records.

Wave height (H_{mo}) is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. The wave period is identified from the computation of a variance (energy) spectrum using a Fast Fourier Transform of 4096 data points (1024 sec). The period (T_p) is that associated with the maximum energy density in the spectrum. When this analysis is complete, the data are written to magnetic tape and entered into the CERC data base.

Table 3 presents the wave heights and periods for each wave record obtained during the month. The monthly means shown in Table 3 are an average of the values computed for all data records collected. The monthly standard deviations are standard deviations from the monthly mean of values for each record.

Figure 3 is a time history of the H_{mo} and T_p values for the Waverider 6 km from shore (630) and the Baylor gage at pier station 19+00 (625).

Differences in wave periods between wave gages (Table 4 and Figure 3) may be due to wave breaking or reformation, or the presence of multiple wave trains containing nearly equal energy.

TABLE 3: WAVE DATA

PART 1

MARCH 1986

| GAGE | DAY | TIME | 645 | | 625 | | 640 | | 630 | |
|------|-----|------|--------------------------|--------|---------------------------|--------|-------------------------|--------|------------------------|--------|
| | | | Baylor at 7+80 Hmo(m) | T(sec) | Baylor at 19+00 Hmo(m) | T(sec) | Nearsho Wvrdr Hmo(m) | T(sec) | Farsho Wvrdr Hmo(m) | T(sec) |
| | 1 | 1 | .87 | 5.31 | 1.00 | 5.99 | 1.07 | 9.75 | 1.00 | 9.75 |
| | 7 | | 1.00 | 5.63 | 1.48 | 4.76 | 1.63 | 5.63 | 1.83 | 5.31 |
| | 13 | | 1.12 | 5.99 | 1.64 | 5.99 | 1.74 | 5.99 | 1.66 | 5.99 |
| | 19 | | .96 | 5.99 | 1.43 | 5.63 | 1.34 | 6.40 | 1.38 | 6.40 |
| 2 | 1 | | 1.09 | 5.99 | 1.16 | 5.63 | 1.26 | 5.99 | 1.48 | 6.40 |
| | 7 | | .93 | 6.87 | 1.61 | 6.40 | 1.53 | 7.42 | 1.66 | 7.42 |
| | 13 | | 1.01 | 5.99 | 1.12 | 6.40 | 1.16 | 8.06 | 1.32 | 7.42 |
| | 19 | | .93 | 5.02 | 1.37 | 9.75 | 1.17 | 10.89 | 1.11 | 9.75 |
| 3 | 1 | | .65 | 6.87 | .85 | 8.06 | .94 | 8.83 | 1.13 | 9.75 |
| | 7 | | .76 | 9.75 | 1.06 | 8.83 | .92 | 9.75 | 1.03 | 10.89 |
| | 13 | | .65 | 10.89 | .94 | 9.75 | 1.08 | 9.75 | 1.02 | 10.89 |
| | 19 | | | | Software Error | | | | | |
| 4 | 1 | | .45 | 10.89 | .72 | 10.89 | .74 | 10.89 | .81 | 10.89 |
| | 7 | | .44 | 9.75 | .73 | 9.75 | .72 | 9.75 | .73 | 10.89 |
| | 13 | | .55 | 9.75 | .73 | 9.75 | .79 | 9.75 | .85 | 9.75 |
| | 19 | | .60 | 9.75 | .72 | 9.75 | .69 | 8.83 | .79 | 9.75 |
| 5 | 1 | | .36 | 8.06 | .60 | 8.83 | .60 | 9.75 | .65 | 8.06 |
| | 7 | | .53 | 2.78 | .71 | 9.75 | .65 | 9.75 | .70 | 3.79 |
| | 13 | | .88 | 5.63 | .96 | 5.63 | .95 | 4.76 | 1.11 | 5.63 |
| | 19 | | .72 | 5.63 | .91 | 7.42 | .85 | 7.42 | .90 | 6.87 |
| 6 | 1 | | .57 | 5.63 | .78 | 7.42 | .82 | 7.42 | .79 | 7.42 |
| | 7 | | | | Disk Crash | | | | | |
| | 13 | | .21 | 9.75 | .44 | 9.75 | .46 | 9.75 | .58 | 10.89 |
| 7 | 1 | | .44 | 3.95 | .55 | 8.83 | .57 | 8.83 | .75 | 2.62 |
| | 7 | | .33 | 8.06 | .35 | 8.06 | .36 | 9.75 | .60 | 10.89 |
| | 13 | | .43 | 1.96 | .51 | 2.42 | .42 | 2.55 | .62 | 9.75 |
| | 19 | | .96 | 4.53 | .96 | 4.76 | 1.00 | 4.76 | 1.04 | 4.76 |
| 8 | 1 | | 1.08 | 8.06 | 2.21 | 7.42 | 2.11 | 8.06 | 2.62 | 8.06 |
| | 7 | | 1.26 | 6.87 | 1.42 | 8.06 | 1.55 | 5.02 | 1.89 | 6.87 |
| | 13 | | .94 | 6.40 | 1.27 | 8.06 | 1.01 | 6.40 | 1.44 | 6.87 |
| | 19 | | .83 | 6.40 | .82 | 5.99 | .77 | 6.40 | 1.01 | 8.83 |
| 9 | 1 | | .39 | 5.02 | .68 | 8.06 | .59 | 8.83 | .73 | 7.42 |
| | 7 | | .33 | 2.55 | .49 | 7.42 | .51 | 6.87 | .59 | 8.06 |
| | 13 | * | | | .44 | 9.75 | .35 | 8.06 | .43 | 8.83 |
| 10 | 1 | | .30 | 2.95 | * | | .30 | 10.89 | .41 | 9.75 |
| | 7 | | .21 | 2.19 | .37 | 9.75 | .32 | 9.75 | .42 | 10.89 |
| | 13 | | .21 | 9.75 | .28 | 10.89 | .28 | 9.75 | .36 | 8.83 |
| | 19 | | .29 | 2.95 | * | | .36 | 8.83 | .45 | 8.83 |
| 11 | 1 | | .47 | 2.55 | .45 | 8.83 | .45 | 8.83 | .65 | 3.15 |
| | 7 | | .30 | 2.09 | .50 | 8.06 | .45 | 6.40 | .65 | 6.40 |
| | 13 | | .45 | 3.95 | .51 | 5.63 | .53 | 6.87 | .86 | 6.40 |
| | 19 | * | | | .62 | 7.42 | .57 | 6.87 | .76 | 6.87 |
| 12 | 1 | | .63 | 3.51 | .78 | 3.38 | .83 | 8.83 | 1.01 | 8.06 |
| | 7 | | .99 | 4.53 | .88 | 4.53 | .82 | 4.32 | .91 | 8.83 |
| | 13 | 1.01 | 5.02 | | 1.30 | 7.42 | 1.35 | 6.40 | 1.48 | 6.87 |
| | 19 | 1.03 | 5.63 | | 1.15 | 5.63 | 1.03 | 6.87 | 1.13 | 8.06 |
| 13 | 1 | | .83 | 5.31 | 1.01 | 7.42 | 1.10 | 7.42 | 1.25 | 7.42 |
| | 7 | | .97 | 5.63 | .97 | 6.87 | .88 | 6.40 | 1.11 | 5.99 |
| | 13 | .83 | 5.31 | | .93 | 5.99 | 1.04 | 6.40 | 1.21 | 5.99 |
| | 19 | .80 | 5.99 | | .96 | 5.63 | .92 | 5.99 | 1.05 | 5.99 |
| 14 | 1 | | .62 | 5.63 | .83 | 5.99 | .91 | 5.99 | 1.04 | 5.99 |
| | 7 | | .63 | 6.40 | .84 | 6.87 | .85 | 6.87 | 1.09 | 7.42 |
| | 13 | .60 | 5.99 | | .73 | 6.40 | .82 | 8.06 | 1.04 | 6.40 |
| | 19 | .71 | 7.42 | | .89 | 6.87 | .92 | 7.42 | 1.13 | 6.87 |
| 15 | 1 | | .91 | 7.42 | 1.02 | 6.87 | 1.09 | 6.87 | 1.60 | 8.06 |
| | 7 | | .69 | 9.75 | .78 | 8.83 | .82 | 8.06 | 1.22 | 9.75 |
| | 13 | .47 | 10.89 | | .60 | 10.89 | .61 | 10.89 | .81 | 8.83 |
| | 19 | .38 | 9.75 | | .60 | 8.83 | .58 | 9.75 | .70 | 9.75 |
| 16 | 1 | | .43 | 8.83 | .55 | 8.06 | .54 | 8.83 | .56 | 8.83 |
| | 7 | | .30 | 8.83 | .42 | 8.06 | .49 | 7.42 | .60 | 8.83 |
| | 13 | .25 | 8.83 | | .43 | 8.06 | .48 | 8.06 | .54 | 7.42 |
| | 19 | .26 | 5.02 | | .41 | 8.83 | .40 | 8.83 | .47 | 6.40 |
| | 19 | .23 | 12.34 | | .44 | 8.83 | .43 | 8.06 | .51 | 8.06 |

*=Electronic Problems

TABLE 3: WAVE DATA

PART 2

MARCH 1986

| GAGE | | 645 | | 625 | | 640 | | 630 | |
|------|------|--------------------------|--------|---------------------------|--------|-------------------------|--------|------------------------|--------|
| DAY | TIME | Baylor at 7+80 Hmo(m) | T(sec) | Baylor at 19+00 Hmo(m) | T(sec) | Nearshr Wvrdr Hmo(m) | T(sec) | Farshr Wvrdr Hmo(m) | T(sec) |
| 17 | 1 | | | .61 | 9.75 | .68 | 7.42 | .70 | 8.83 |
| | 7 | .83 | 4.32 | .99 | 4.53 | .88 | 4.53 | 1.11 | 4.53 |
| | 13 | .97 | 6.40 | 1.17 | 8.06 | 1.13 | 6.87 | 1.42 | 6.40 |
| 18 | 19 | .62 | 5.63 | .81 | 6.87 | .79 | 6.87 | .89 | 5.99 |
| 1 | .50 | 5.99 | .70 | 6.40 | .70 | 6.87 | .80 | 6.87 | |
| 7 | .41 | 4.32 | .66 | 5.99 | .63 | 6.40 | .72 | 5.99 | |
| 13 | .41 | 4.13 | .57 | 8.06 | .58 | 8.83 | .56 | 8.83 | |
| 19 | .32 | 7.42 | .56 | 8.06 | .50 | 8.83 | .57 | 5.99 | |
| 1 | .43 | 3.95 | * | | .68 | 3.95 | .74 | 3.38 | |
| 7 | .70 | 5.99 | .83 | 5.63 | .82 | 6.40 | 1.05 | 6.40 | |
| 13 | .78 | 7.42 | .94 | 7.42 | .98 | 6.87 | 1.31 | 5.31 | |
| 19 | | | | | | | | | |
| 20 | 1 | Operator Error | | | | | | | |
| | 7 | .61 | 8.83 | .75 | 8.83 | .74 | 9.75 | .87 | 8.06 |
| | 13 | .40 | 8.06 | .58 | 8.06 | .64 | 8.83 | .75 | 5.99 |
| 19 | .99 | 5.02 | 1.33 | 4.32 | 1.29 | 5.02 | 1.43 | 4.32 | |
| 21 | 1 | 1.07 | 4.76 | 1.58 | 5.99 | 1.60 | 6.40 | 1.58 | 6.40 |
| | 7 | 1.11 | 6.87 | 2.39 | 6.87 | 2.25 | 6.87 | 3.19 | 6.87 |
| 13 | 1.07 | 8.06 | 2.01 | 6.87 | 2.14 | 7.42 | 2.51 | 7.42 | |
| 19 | 1.13 | 6.40 | 1.78 | 6.87 | 1.82 | 7.42 | 1.96 | 8.83 | |
| 22 | 1 | 1.13 | 5.99 | 2.04 | 5.99 | 1.79 | 5.99 | 1.96 | 8.06 |
| | 7 | 1.18 | 5.99 | 1.71 | 6.40 | 1.83 | 7.42 | 1.98 | 5.63 |
| 13 | 1.11 | 7.42 | 2.03 | 6.87 | 1.91 | 8.06 | 2.15 | 6.87 | |
| 19 | 1.14 | 4.53 | 1.65 | 6.87 | 1.67 | 8.06 | 1.63 | 8.83 | |
| 23 | 1 | 1.08 | 3.95 | 1.64 | 9.75 | 1.46 | 7.42 | 1.49 | 9.75 |
| | 7 | 1.10 | 5.02 | 1.42 | 9.75 | 1.47 | 9.75 | 1.58 | 9.75 |
| 13 | 1.17 | 10.89 | 1.53 | 9.75 | 1.46 | 9.75 | 1.63 | 10.89 | |
| 19 | 1.07 | 10.89 | 1.42 | 10.89 | 1.68 | 9.75 | 1.50 | 9.75 | |
| 24 | 1 | 1.09 | 10.89 | * | | 1.32 | 10.89 | 1.13 | 8.83 |
| | 7 | .52 | 10.89 | .89 | 10.89 | .90 | 10.89 | .96 | 10.89 |
| 13 | .98 | 10.89 | * | | | 1.04 | 12.34 | .90 | 10.89 |
| 19 | .84 | 4.13 | .99 | 12.34 | | 1.12 | 9.75 | 1.18 | 12.34 |
| 25 | 1 | .90 | 6.40 | 1.26 | 6.87 | 1.08 | 6.40 | 1.08 | 10.89 |
| | 7 | .67 | 10.89 | .95 | 9.75 | 1.07 | 10.89 | 1.01 | 10.89 |
| 13 | .76 | 5.31 | 1.15 | 9.75 | .99 | 9.75 | 1.04 | 10.89 | |
| 19 | .58 | 10.89 | .98 | 10.89 | .91 | 9.75 | 1.13 | 10.89 | |
| 26 | 1 | .52 | 4.53 | .90 | 10.89 | .80 | 10.89 | .85 | 10.89 |
| | 7 | .60 | 5.63 | .91 | 9.75 | .92 | 9.75 | 1.03 | 9.75 |
| 13 | .64 | 9.75 | .96 | 6.40 | .81 | 6.40 | .95 | 9.75 | |
| 19 | .61 | 6.40 | .81 | 6.87 | .97 | 6.40 | 1.08 | 6.40 | |
| 27 | 1 | .67 | 9.75 | .88 | 7.42 | .82 | 9.75 | .98 | 9.75 |
| | 7 | .66 | 8.06 | 1.11 | 8.83 | .91 | 8.06 | 1.13 | 9.75 |
| 13 | .59 | 9.75 | 1.30 | 8.83 | .77 | 8.83 | .96 | 7.42 | |
| 19 | .60 | 9.75 | .91 | 8.83 | .86 | 8.83 | .89 | 8.83 | |
| 28 | 1 | .88 | 3.05 | 1.09 | 9.75 | .98 | 9.75 | 1.09 | 9.75 |
| | 7 | 1.00 | 4.59 | 1.26 | 10.04 | 1.30 | 4.48 | 1.40 | 10.04 |
| 13 | 1.06 | 4.96 | 1.22 | 10.04 | 1.16 | 10.61 | 1.28 | 6.52 | |
| 19 | .84 | 5.55 | .98 | 10.04 | 1.03 | 10.61 | 1.08 | 11.25 | |
| 29 | 1 | .80 | 10.61 | .90 | 10.61 | .91 | 11.25 | .96 | 10.61 |
| | 7 | .75 | 10.04 | 1.13 | 10.61 | .99 | 10.61 | .93 | 10.61 |
| 13 | .66 | 10.89 | .85 | 9.75 | .82 | 10.89 | .94 | 10.89 | |
| 19 | .49 | 9.75 | * | | .86 | 9.75 | .91 | 8.83 | |
| 30 | 1 | .53 | 9.75 | * | | .71 | 9.75 | .79 | 10.89 |
| | 7 | .55 | 9.75 | | | .79 | 9.75 | .83 | 9.75 |
| 13 | .52 | 9.75 | | | .85 | 10.89 | .89 | 10.89 | |
| 19 | .67 | 9.75 | | | .79 | 9.75 | .92 | 9.75 | |
| 31 | 1 | .57 | 9.75 | | | .74 | 10.89 | .87 | 9.75 |
| | 7 | .58 | 8.83 | | | .69 | 8.06 | .78 | 9.75 |
| 13 | .43 | 9.75 | .78 | 9.75 | | .64 | 10.89 | .74 | 9.75 |
| 19 | .55 | 9.75 | * | | | .66 | 9.75 | .78 | 9.75 |
| MEAN | | .70 | 6.97 | .98 | 7.92 | .94 | 8.21 | 1.07 | 8.25 |
| STD | | .27 | 2.56 | .43 | 1.91 | .41 | 1.92 | .46 | 2.06 |

*=Electronic Problems

CERC, Gage Number 630, Waverider, 6 km from shore

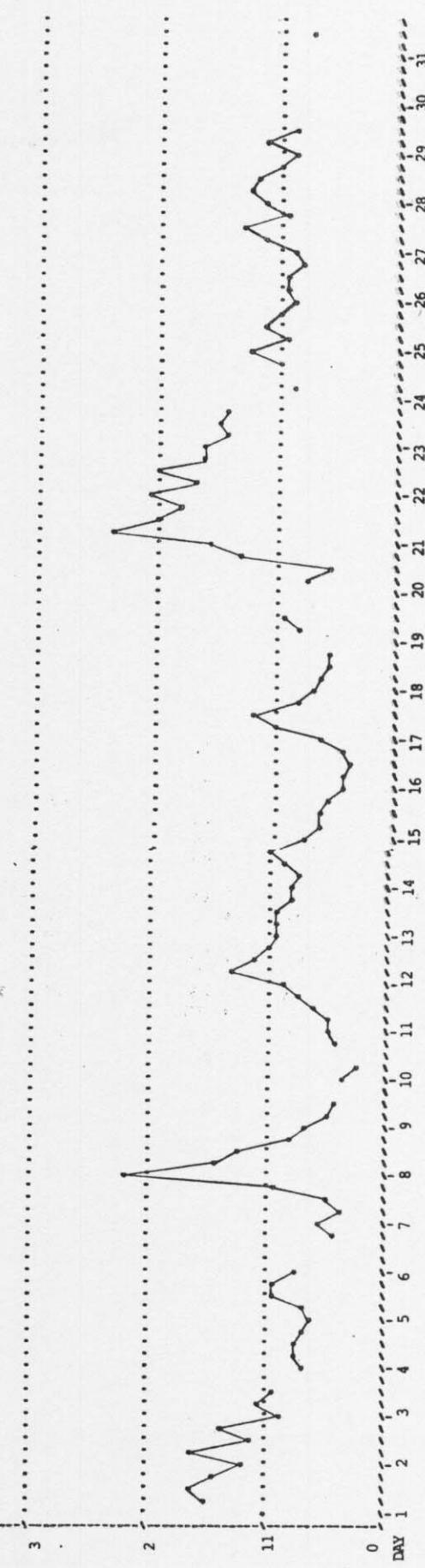
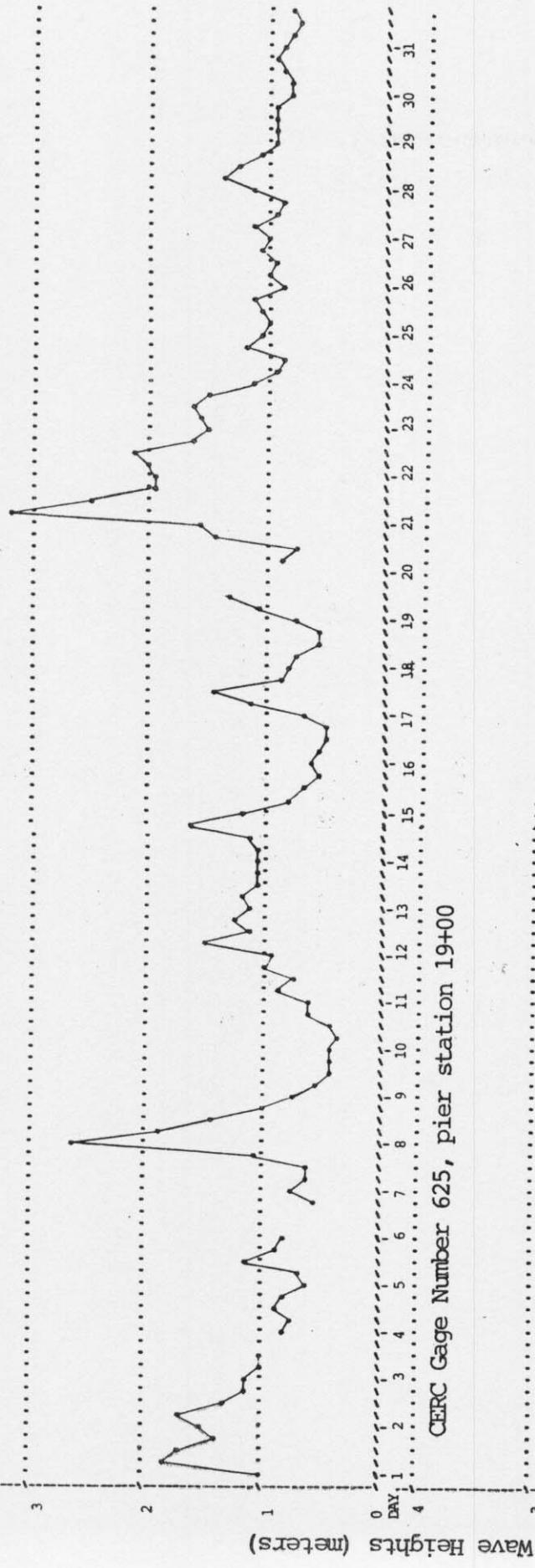


FIGURE 3. Time History of Wave Heights and Periods - March 1986
Part I: Heights

CERC Gage Number 630, Waverider 6 km from shore

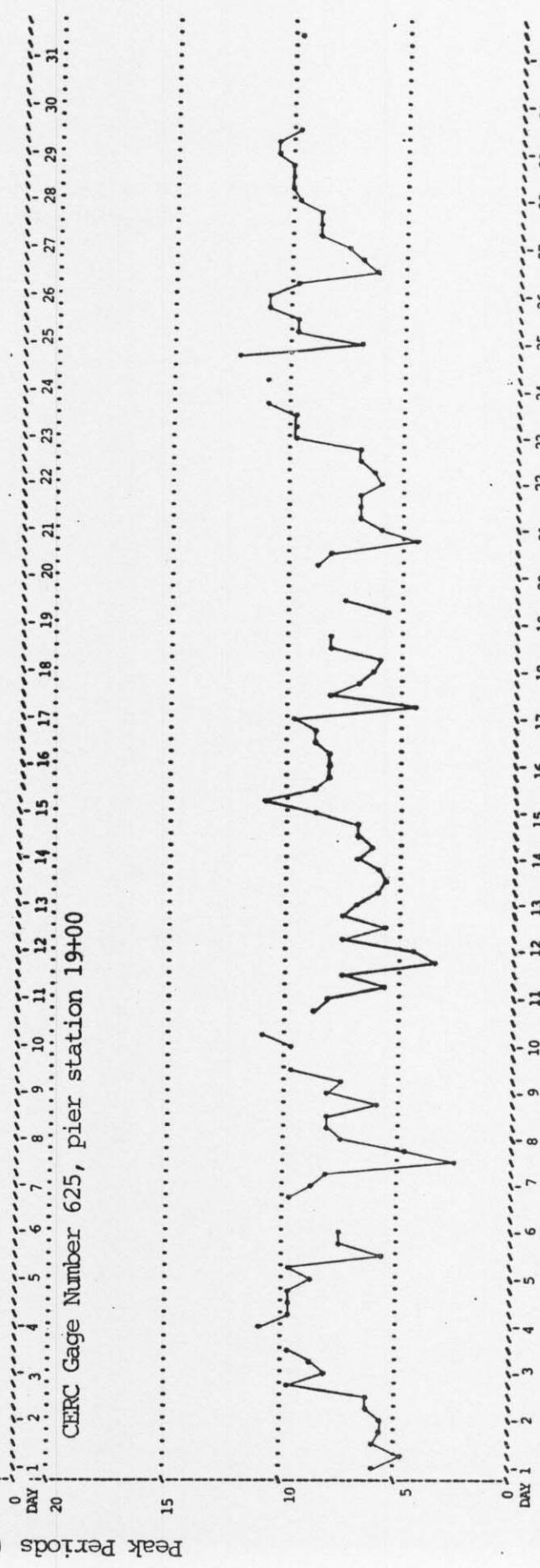
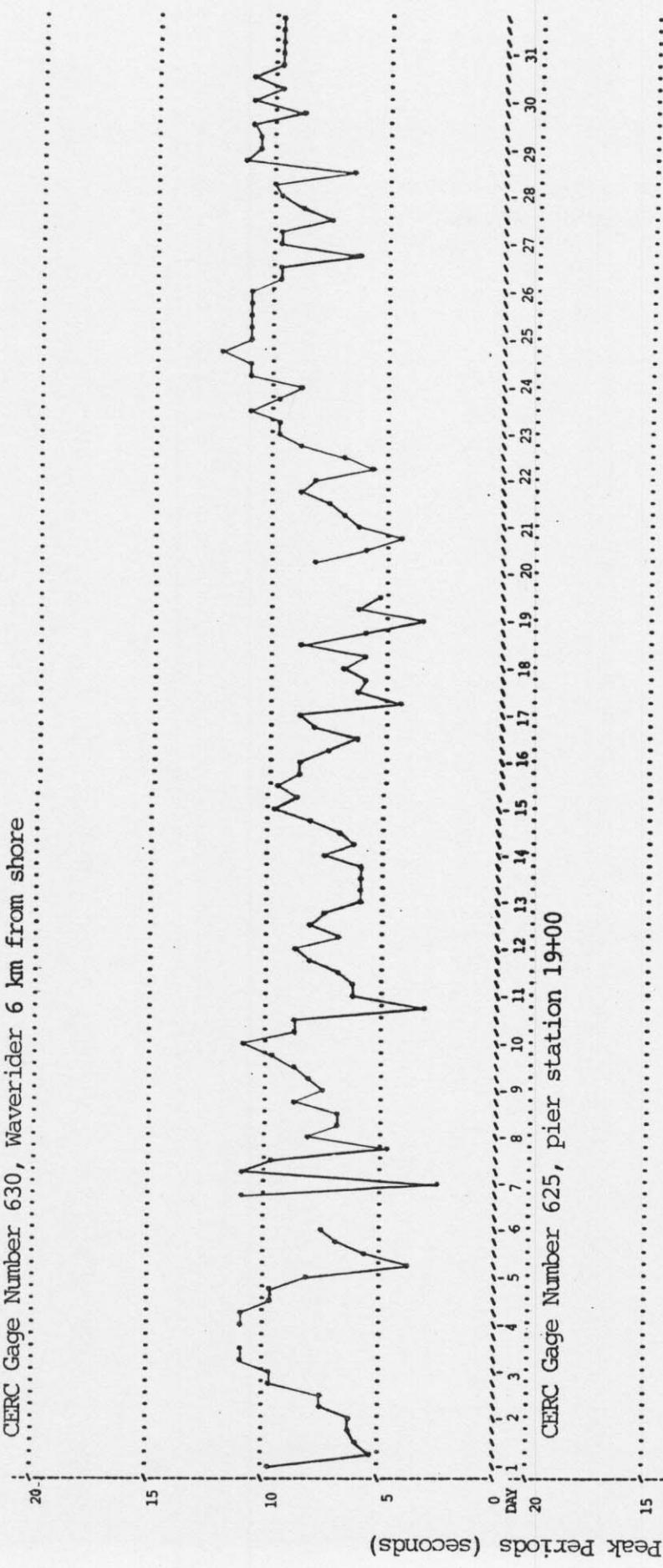


FIGURE 3. Time History of Wave Heights and Periods - March 1986

Part III: Periods

IV. CURRENT DATA

Current data (Table 4) are collected from two Marsh-McBirney electromagnetic biaxial current meters (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, alongshore currents flow either toward 340 (i.e. northward) or toward 160 (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second.

TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

March 1986

| PIER MEASUREMENTS | | | | | | | | | | BEACH MEASUREMENTS (500 UPDRIFT) | | | | | | | | | | |
|-------------------|-----------------|--------|----------------|----------------------|-----------|--------------|-----------------|-----|-------|-------------------------------------|-------|-----|-------|-----|-------|-----|-------|-----|-----|--|
| DAY: | TIME | DYE AT | CURRENT METER | DYE AT MID SURF ZONE | (SURFACE) | DYE | CURRENT METER | | | | | | | | | | | | | |
| | | 19+00 | AT 14+20(433m) | (579m) | | 12M OFFSHORE | AT SOUTH TRIFON | | | | | | | | | | | | | |
| | | SPEED | DIR | SPEED | DIR | BASELINE(M) | SPEED | DIR | SPEED | LOCATION | SPEED | DIR | SPEED | DIR | SPEED | DIR | SPEED | DIR | | |
| 1 | 0100-Alongshore | 12 | S | | | | | | | | | | | | | | | | | |
| | Cross-shore | | | 3 | ON | | | | | | | | | | | | | 4 | OF | |
| | Resultant | | | 13 | 176 | | | | | | | | | | | | | 25 | 150 | |
| 1 | 0700-Alongshore | 68 | S | 20 | S | | | 102 | S | | | | | | | | 37 | S | 33 | |
| | Cross-shore | 14 | On | 8 | ON | 176 | | 20 | On | | | | | | | | 7 | OF | 7 | |
| 1 | 1300-Alongshore | 69 | 171 | 22 | 180 | | | 104 | 171 | | | | | | | | | 34 | 148 | |
| | Cross-shore | | | 27 | S | | | | | | | | | | | | | 44 | S | |
| | Resultant | | | 9 | ON | | | | | | | | | | | | | ? | OF | |
| 1 | 1900-Alongshore | | | 28 | 178 | | | | | | | | | | | | | 45 | 142 | |
| | Cross-shore | | | 18 | S | | | | | | | | | | | | | 30 | S | |
| | Resultant | | | 7 | ON | | | | | | | | | | | | | 7 | OF | |
| 2 | 0100-Alongshore | | | 19 | 180 | | | | | | | | | | | | | 31 | 147 | |
| | Cross-shore | | | 16 | S | | | | | | | | | | | | | 32 | S | |
| | Resultant | | | 7 | ON | | | | | | | | | | | | | 6 | OF | |
| 2 | 0700-Alongshore | 55 | S | 12 | S | | | | | | | | | | | | 43 | S | 20 | |
| | Cross-shore | 14 | Off | 5 | ON | | | 152 | S | | | | | | | | 4 | S | OF | |
| 2 | 1300-Alongshore | 57 | 146 | 13 | 182 | | | 164 | | 76 | Off | | | | | | | 21 | 150 | |
| | Cross-shore | | | 13 | S | | | 170 | 133 | | | | | | | | 25 | S | | |
| | Resultant | | | 5 | ON | | | | | | | | | | | | 7 | OF | | |
| 2 | 1900-Alongshore | | | 14 | 179 | | | | | | | | | | | | | 26 | 145 | |
| | Cross-shore | | | 2 | S | | | | | | | | | | | | 18 | S | | |
| | Resultant | | | 2 | ON | | | | | | | | | | | | 3 | OF | | |
| 3 | 0100-Alongshore | | | 3 | 122 | | | | | | | | | | | | | 18 | 142 | |
| | Cross-shore | | | 9 | S | | | | | | | | | | | | 9 | S | | |
| | Resultant | | | 4 | ON | | | | | | | | | | | | 1 | OF | | |
| 3 | 0700-Alongshore | | | 10 | 182 | | | | | | | | | | | | 2 | N | 156 | |
| | Cross-shore | 24 | N | 0 | | | | | | | | | | | | | 4 | N | | |
| | Bezelight | 5 | Off | 1 | OF | | | 176 | | 8 | Off | | | | | | | 0 | | |
| 3 | 1300-Alongshore | 25 | 251 | 1 | 70 | | | | | 8 | 70 | | | | | | 4 | S | 340 | |
| | Cross-shore | | | 1 | S | | | | | | | | | | | | 1 | S | | |
| | Resultant | | | 0 | | | | | | | | | | | | | 6 | OF | | |
| 3 | 1900-Alongshore | | | 1 | 160 | | | | | | | | | | | | 6 | ZZ | | |
| | Cross-shore | | | | | | | | | | | | | | | | | | | |
| | Resultant | | | | | | | | | | | | | | | | | | | |
| 4 | 0100-Alongshore | | | 6 | S | | | | | | | | | | | | 16 | S | | |
| | Cross-shore | | | 0 | | | | | | | | | | | | | 3 | OF | | |
| | Resultant | | | 6 | 160 | | | | | | | | | | | | 17 | 148 | | |
| 4 | 0700-Alongshore | 23 | S | 11 | S | | | | | | | | | | | | 17 | S | | |
| | Cross-shore | 3 | On | 2 | OF | | | 176 | | 7 | Off | | | | | | 17 | OF | | |
| 4 | 1300-Alongshore | 23 | 169 | 11 | 151 | | | | | | | | | | | | 24 | 114 | | |
| | Cross-shore | | | 7 | S | | | | | | | | | | | | 10 | S | | |
| | Resultant | | | 2 | ON | | | | | | | | | | | | 13 | OF | | |
| 4 | 1900-Alongshore | | | 7 | 173 | | | | | | | | | | | | 16 | 198 | | |
| | Cross-shore | | | 6 | S | | | | | | | | | | | | 8 | S | | |
| | Resultant | | | 2 | OF | | | | | | | | | | | | 5 | OF | | |
| 5 | 0100-Alongshore | | | 6 | 144 | | | | | | | | | | | | 9 | 122 | | |
| | Cross-shore | 3 | S | 0 | | | | | | | | | | | | | 10 | S | | |
| | Resultant | | | 3 | 160 | | | | | | | | | | | | 6 | OF | | |
| 5 | 0700-Alongshore | 38 | S | 12 | S | | | | | | | | | | | | 11 | 130 | | |
| | Cross-shore | 11 | Off | 4 | ON | | | 38 | S | 11 | Off | | | | | | 30 | S | | |
| 5 | 1300-Alongshore | 40 | 143 | 13 | 172 | | | 164 | | 40 | 143 | | | | | | 6 | OF | | |
| | Cross-shore | | | 17 | S | | | | | | | | | | | | 30 | 142 | | |
| | Resultant | | | 8 | ON | | | | | | | | | | | | 34 | S | | |
| 5 | 1900-Alongshore | | | 18 | 184 | | | | | | | | | | | | 9 | OF | | |
| | Cross-shore | | | 2 | S | | | | | | | | | | | | 35 | 145 | | |
| | Resultant | | | 2 | ON | | | | | | | | | | | | 18 | S | | |
| 6 | 0100-Alongshore | | | 3 | 211 | | | | | | | | | | | | 8 | OF | | |
| | Cross-shore | | | 1 | ON | | | | | | | | | | | | 20 | 135 | | |
| | Resultant | | | 4 | 181 | | | | | | | | | | | | 15 | S | | |
| 6 | 0700-Alongshore | 25 | N | | | | | 32 | N | | | | | | | | 6 | OF | | |
| | Cross-shore | 15 | Off | | | | | 180 | | 0 | 0 | | | | | | 16 | 138 | | |
| | Resultant | 30 | 11 | | | | | | | | | | | | | | | | | |
| 6 | 1300-Alongshore | | | | | | | 32 | | 340 | | | | | | | | | | |
| | Cross-shore | | | | | | | | | | | | | | | | | | | |
| | Resultant | | | | | | | | | | | | | | | | | | | |
| 6 | 1900-Alongshore | | | 6 | N | | | | | | | | | | | | 4 | S | | |
| | Cross-shore | | | 1 | ON | | | | | | | | | | | | 1 | ON | | |
| | Resultant | | | 1 | 6 | 332 | | | | | | | | | | | 4 | 180 | | |

KEY = ALL SPEEDS IN CM/SEC
 N=NORTHWARD, SHORE PARALLEL
 S=SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

| DAY: | TIME | PIER MEASUREMENTS | | | | BEACH MEASUREMENTS (500' UPDRIFT) | | | | CURRENT METER | | | |
|------|-----------------|-------------------|---------------|----------------------|--------------|--------------------------------------|-------|-------|----------|---------------|-----|-------|-----|
| | | DYE AT | CURRENT METER | DYE AT MID-SURF ZONE | DYE | AT SOUTH TRIPOD | | | | | | | |
| | | (579m) | I.D. #639 | (SURFACE) | 12M OFFSHORE | (DEPTH -4.8m MSL) | | | | | | | |
| | | SPEED | DIR | SPEED | DIR | BASELINE (M) | SPEED | DIR | LOCATION | SPEED | DIR | SPEED | DIR |
| | | 1 | 2 | 3 | 4 | | 5 | 6 | | 7 | 8 | 9 | 10 |
| 7 | 0100-Alongshore | 7 | N | | | | | | | 3 | OF | | |
| | Cross-shore | 2 | ON | | | | | | | 5 | 120 | | |
| | Resultant | 7 | 322 | | | | | | | 7 | N | | |
| 7 | 0700-Alongshore | 12 | N | 3 | N | | 14 | N | | 22 | N | 1 | OF |
| | Cross-shore | Off | 2 | OF | | 152 | 12 | Off | South | | | 6 | OF |
| | Resultant | 12 | 18 | 4 | 12 | | 18 | 22 | | 7 | 353 | | |
| 7 | 1300-Alongshore | | | 1 | N | | | | | 7 | N | | |
| | Cross-shore | | | 3 | OF | | | | | 6 | OF | | |
| | Resultant | | | 3 | 45 | | | | | 9 | 17 | | |
| 7 | 1900-Alongshore | | | 11 | S | | | | | 19 | S | | |
| | Cross-shore | | | 5 | ON | | | | | 10 | OF | | |
| | Resultant | | | 12 | 182 | | | | | 21 | 133 | | |
| 8 | 0100-Alongshore | 63 | S | | | | | | | 52 | S | | |
| | Cross-shore | 20 | ON | | | | | | | 8 | OF | | |
| | Resultant | 66 | 178 | | | | | | | 53 | 151 | | |
| 8 | 0700-Alongshore | 51 | S | 25 | S | | 102 | S | | 67 | S | 39 | S |
| | Cross-shore | 0 | 0 | 9 | ON | 176 | 0 | 0 | North | | | 7 | OF |
| | Resultant | 51 | 160 | 27 | 180 | | 102 | 160 | | 49 | 150 | | |
| 8 | 1300-Alongshore | | | 13 | S | | | | | 21 | S | | |
| | Cross-shore | | | 4 | ON | | | | | 5 | OF | | |
| | Resultant | | | 14 | 178 | | | | | 21 | 145 | | |
| 8 | 1900-Alongshore | | | 9 | S | | | | | 11 | S | | |
| | Cross-shore | | | 0 | ON | | | | | 6 | OF | | |
| | Resultant | | | 9 | 160 | | | | | 13 | 130 | | |
| 9 | 0100-Alongshore | | | 4 | S | | | | | 11 | S | | |
| | Cross-shore | | | 0 | ON | | | | | 7 | OF | | |
| | Resultant | | | 4 | 160 | | | | | 13 | 128 | | |
| 9 | 0700-Alongshore | 14 | N | 0 | | | 8 | N | | 26 | N | 1 | N |
| | Cross-shore | Off | 1 | OF | 152 | 3 | Off | South | | 1 | OF | | |
| | Resultant | 14 | 20 | 1 | 79 | | 8 | 2 | | 1 | 14 | | |
| 9 | 1300-Alongshore | | | 4 | N | | | | | 10 | N | | |
| | Cross-shore | | | 3 | OF | | | | | 0 | OF | | |
| | Resultant | | | 5 | 19 | | | | | 10 | 340 | | |
| 9 | 1900-Alongshore | | | 2 | N | | | | | 3 | N | | |
| | Cross-shore | | | 3 | OF | | | | | 0 | OF | | |
| | Resultant | | | 3 | 35 | | | | | 3 | 340 | | |
| 10 | 0100-Alongshore | | | 2 | N | | | | | 4 | 3 | | |
| | Cross-shore | | | 3 | OF | | | | | 0 | OF | | |
| | Resultant | | | 4 | 36 | | | | | 3 | 358 | | |
| 10 | 0700-Alongshore | 12 | N | 1 | N | | 5 | N | | 18 | N | 4 | 160 |
| | Cross-shore | Off | 2 | OF | 152 | 5 | Off | South | | 5 | N | | |
| | Resultant | 23 | 40 | 2 | 43 | | 7 | 25 | | 5 | 351 | | |
| 10 | 1300-Alongshore | | | 2 | N | | | | | 3 | N | | |
| | Cross-shore | | | 3 | OF | | | | | 1 | OF | | |
| | Resultant | | | 4 | 36 | | | | | 3 | 358 | | |
| 10 | 1900-Alongshore | | | 3 | N | | | | | 7 | N | | |
| | Cross-shore | | | 4 | OF | | | | | 1 | OF | | |
| | Resultant | | | 1 | 5 | 33 | | | | 7 | 348 | | |
| 11 | 0100-Alongshore | | | 6 | N | | | | | 13 | N | | |
| | Cross-shore | | | 5 | OF | | | | | 2 | OF | | |
| | Resultant | | | 8 | 29 | | | | | 13 | 342 | | |
| 11 | 0700-Alongshore | 27 | N | 6 | N | | 21 | N | | 21 | N | 16 | N |
| | Cross-shore | Off | 4 | OF | 152 | 9 | Off | South | | 1 | OF | | |
| | Resultant | 29 | 4 | 7 | 14 | | 23 | 4 | | 16 | 344 | | |
| 11 | 1300-Alongshore | | | 3 | N | | | | | 10 | N | | |
| | Cross-shore | | | 3 | OF | | | | | 3 | OF | | |
| | Resultant | | | 4 | 25 | | | | | 10 | 352 | | |
| 11 | 1900-Alongshore | | | 1 | S | | | | | 0 | OF | | |
| | Cross-shore | | | 2 | OF | | | | | 4 | OF | | |
| | Resultant | | | 2 | 27 | | | | | 4 | 70 | | |
| 12 | 0100-Alongshore | | | 6 | S | | | | | 11 | S | | |
| | Cross-shore | | | 1 | OF | | | | | 13 | OF | | |
| | Resultant | | | 6 | 151 | | | | | 4 | 110 | | |
| 12 | 0700-Alongshore | 23 | S | 4 | S | | 47 | S | | 58 | S | 17 | 110 |
| | Cross-shore | On | 3 | OF | 167 | 0 | 0 | North | | 12 | S | 2 | ON |
| | Resultant | 23 | 160 | 5 | 123 | | 47 | 160 | | 12 | 162 | | |
| 12 | 1300-Alongshore | | | 6 | S | | | | | 26 | S | | |
| | Cross-shore | | | 2 | ON | | | | | 8 | OF | | |
| | Resultant | | | 6 | 178 | | | | | 27 | 143 | | |
| 12 | 1900-Alongshore | | | 6 | S | | | | | 19 | S | | |
| | Cross-shore | | | 2 | ON | | | | | 12 | OF | | |
| | Resultant | | | 6 | 178 | | | | | 22 | 128 | | |

KEY = ALL SPEEDS IN CM/SEC
 N = NORTHWARD, SHORE PARALLEL
 S = SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

| PIER MEASUREMENTS | | | | BEACH MEASUREMENTS (500 UPDRIFT) | | | |
|-------------------|------------------------------|----------------------|--------------------------------------|-------------------------------------|-----------|----------|-----------|
| DYE AT | CURRENT METER | DYE AT MID-SURF ZONE | CURRENT METER | | | | |
| (19:00 (579m)) | AT 14+20(433m) (SURFACE)) | (SURFACE) | AT SOUTH TRIPOD (DEPTH -4.8m MSL) | | | | |
| DAY | TIME | SPEED DIR SPEED | DIR | BASELINE(M) | SPEED DIR | LOCATION | SPEED DIR |
| 13 | 0100-Alongshore | 3 S | | | | | 22 S |
| | Cross-shore | 2 OF | | | | | 4 OF |
| | Resultant | 4 126 | | | | | 22 150 |
| 13 | 0700-Alongshore | 16 S 1 S | | 11 N | | 21 N | 12 S |
| | Cross-shore | 4 On 0 | | 164 3 Off | | | 12 OF |
| | Resultant | 17 174 1 160 | | 11 357 | | | 17 115 |
| 13 | 1300-Alongshore | 12 S | | | | | 33 S |
| | Cross-shore | 1 OF | | | | | 1 OF |
| | Resultant | 12 155 | | | | | 35 140 |
| 13 | 1900-Alongshore | 10 N | | | | | 1 S |
| | Cross-shore | 4 OF | | | | | 7 OF |
| | Resultant | 11 2 | | | | | 2 78 |
| 14 | 0100-Alongshore | 4 N | | | | | 12 S |
| | Cross shore | 3 ON | | | | | 3 OF |
| | Resultant | 5 303 | | | | | 12 146 |
| 14 | 0700-Alongshore | 5 N 0 | | 68 N | | 87 N | 16 S |
| | Cross-shore | 11 On 0 | | 137 3 On | | | 4 OF |
| | Resultant | 12 277 0 0 | | 68 337 | | | 16 146 |
| 14 | 1300-Alongshore | 12 N | | | | | 5 N |
| | Cross-shore | 8 OF | | | | | 1 OF |
| | Resultant | 14 14 | | | | | 5 351 |
| 14 | 1900-Alongshore | 13 N | | | | | 22 N |
| | Cross-shore | 9 OF | | | | | 3 OF |
| | Resultant | 16 15 | | | | | 22 348 |
| 15 | 0100-Alongshore | 6 N | | | | | 16 N |
| | Cross-shore | 3 OF | | | | | 4 ON |
| | Resultant | 7 Z | | | | | 16 326 |
| 15 | 0700-Alongshore | 19 N 9 N | | 51 N | | 17 N | 17 N |
| | Cross-shore | 13 On 3 OF | | 152 5 Off | | | 1 OF |
| | Resultant | 23 305 9 358 | | 51 346 | | | 12 343 |
| 15 | 1300-Alongshore | 7 N | | | | | 8 N |
| | Cross-shore | 3 OF | | | | | 4 OF |
| | Resultant | 8 3 | | | | | 9 Z |
| 15 | 1900-Alongshore | 5 N | | | | | 13 N |
| | Cross-shore | 3 OF | | | | | 0 |
| | Resultant | 6 11 | | | | | 13 340 |
| 16 | 0100-Alongshore | 5 N | | | | | 4 N |
| | Cross-shore | 2 OF | | | | | 2 OF |
| | Resultant | 5 2 | | | | | 4 Z |
| 16 | 0700-Alongshore | 23 S 4 N | | 8 N | | 2 N | 0 |
| | Cross-shore | 0 0 2 OF | | 137 2 Off | | | 5 OF |
| | Resultant | 1 160 4 Z | | 8 351 | | | 5 ZO |
| 16 | 1300-Alongshore | 7 S | | | | | 14 S |
| | Cross-shore | 1 ON | | | | | 9 OF |
| | Resultant | 7 168 | | | | | 17 122 |
| 16 | 1900-Alongshore | 4 N | | | | | 3 S |
| | Cross-shore | 3 OF | | | | | 5 OF |
| | Resultant | 5 17 | | | | | 6 101 |
| 17 | 0100-Alongshore | 12 S | | | | | 16 S |
| | Cross-shore | 1 OF | | | | | 11 OF |
| | Resultant | 12 155 | | | | | 19 125 |
| 17 | 0700-Alongshore | 68 S 17 S | | 38 S | | 55 S | 21 S |
| | Cross-shore | 10 On 5 ON | | 173 0 0 North | | | 4 OF |
| | Resultant | 68 169 18 176 | | 38 160 | | | 21 149 |
| 17 | 1300-Alongshore | 8 S | | | | | 43 S |
| | Cross-shore | 2 ON | | | | | 10 OF |
| | Resultant | 8 174 | | | | | 44 147 |
| 17 | 1900-Alongshore | 10 S | | | | | 25 S |
| | Cross-shore | 1 ON | | | | | 7 OF |
| | Resultant | 10 166 | | | | | 26 144 |
| 18 | 0100-Alongshore | 20 S | | | | | 14 S |
| | Cross-shore | 5 ON | | | | | 10 OF |
| | Resultant | 21 174 | | | | | 17 124 |
| 18 | 0700-Alongshore | 38 S 8 S | | 16 S | | 9 S | 17 S |
| | Cross-shore | 4 On 2 ON | | 164 5 On North | | | 0 |
| | Resultant | 38 166 8 174 | | 17 143 | | | 34 160 |
| 18 | 1300-Alongshore | 8 S | | | | | 16 S |
| | Cross-shore | 5 ON | | | | | 5 OF |
| | Resultant | 9 172 | | | | | 17 143 |
| 18 | 1900-Alongshore | 3 S | | | | | 26 S |
| | Cross-shore | 3 ON | | | | | 11 OF |
| | Resultant | 4 205 | | | | | 28 132 |

KEY = ALL SPEEDS IN CM/SEC
 N =NORTHWARD, SHORE PARALLEL
 S =SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

| PIER MEASUREMENTS | | | | | | | | | | BEACH MEASUREMENTS | | | | | | | | | |
|-------------------|-----------------|--------|---------------|----------------------|-----|-------------------|-----|-------------|-------|--------------------|----------|-------------------|-----|---------------|-----|-----------------|--|--|--|
| | | | | | | | | | | | | | | | | | | | |
| TIME | | DYE AT | CURRENT METER | DYE AT MID-SURF ZONE | | (SURFACE) | | DIST. FROM | | 12M OFFSHORE | | (DEPTH -4.8m MSL) | | CURRENT METER | | AT SOUTH TRIPOD | | | |
| DAY: | | (579m) | I.D. #639 | (SURFACE) | | (DEPTH -4.2m MSL) | | DIST. FROM | | (SURFACE) | | (DEPTH -4.8m MSL) | | I.D. #679 | | | | | |
| 19 | 0100-Alongshore | | | SPEED | DIR | SPEED | DIR | BASELINE(M) | SPEED | DIR | LOCATION | SPEED | DIR | SPEED | DIR | | | | |
| | Cross-shore | | | 2 | N | | | | | | | 4 | S | | | | | | |
| | Resultant | | | 2 | OF | | | | | | | 2 | OF | | | | | | |
| 19 | 0700-Alongshore | 32 | N | 8 | N | | | 76 | N | | | 4 | 133 | | | | | | |
| | Cross-shore | 11 | Off | 2 | OF | 164 | 0 | 0 | | 108 | N | 2 | S | | | | | | |
| | Resultant | 34 | 359 | 8 | 354 | | | 76 | 340 | | | 2 | 160 | | | | | | |
| 19 | 1300-Alongshore | | | 16 | N | | | | | | | 29 | N | | | | | | |
| | Cross-shore | | | 10 | OF | | | | | | | 1 | OF | | | | | | |
| | Resultant | | | 12 | 12 | | | | | | | 22 | 342 | | | | | | |
| 19 | 1900-Alongshore | | | | | | | | | | | | | | | | | | |
| | Cross-shore | | | | | | | | | | | | | | | | | | |
| | Resultant | | | | | | | | | | | | | | | | | | |
| 20 | 0100-Alongshore | | | | | | | | | | | | | | | | | | |
| | Cross-shore | | | | | | | | | | | | | | | | | | |
| | Resultant | | | | | | | | | | | | | | | | | | |
| 20 | 0700-Alongshore | 1 | S | 4 | N | | | 61 | S | | | 9 | N | 4 | N | | | | |
| | Cross-shore | 1 | On | 2 | OF | 164 | | 15 | On | North | | 4 | OF | | | | | | |
| | Resultant | 2 | 197 | 4 | 7 | | | 63 | 174 | | | 6 | 25 | | | | | | |
| 20 | 1300-Alongshore | | | 0 | | | | | | | | 4 | S | | | | | | |
| | Cross-shore | | | 0 | | | | | | | | 3 | OF | | | | | | |
| | Resultant | | | 0 | 0 | | | | | | | 5 | 123 | | | | | | |
| 20 | 1900-Alongshore | | | 10 | S | | | | | | | 20 | S | | | | | | |
| | Cross-shore | | | 0 | | | | | | | | 8 | OF | | | | | | |
| | Resultant | | | 10 | 169 | | | | | | | 22 | 138 | | | | | | |
| 21 | 0100-Alongshore | | | 16 | S | | | | | | | 22 | S | | | | | | |
| | Cross-shore | | | 3 | ON | | | | | | | 7 | OF | | | | | | |
| | Resultant | | | 16 | 171 | | | | | | | 23 | 151 | | | | | | |
| 21 | 0700-Alongshore | 87 | S | 69 | S | | | 203 | S | | | 24 | S | | | | | | |
| | Cross-shore | 35 | On | 19 | ON | 201 | | 30 | On | North | 108 | S | 15 | OF | | | | | |
| | Resultant | 94 | 181 | 72 | 175 | | | 205 | 169 | | | 76 | 149 | | | | | | |
| 21 | 1300-Alongshore | | | 47 | S | | | | | | | 72 | S | | | | | | |
| | Cross-shore | | | 14 | ON | | | | | | | 11 | OF | | | | | | |
| | Resultant | | | 49 | 172 | | | | | | | 73 | | | | | | | |
| 21 | 1900-Alongshore | | | 30 | S | | | | | | | 63 | S | | | | | | |
| | Cross-shore | | | 7 | ON | | | | | | | 10 | OF | | | | | | |
| | Resultant | | | 31 | 173 | | | | | | | 64 | 151 | | | | | | |
| 22 | 0100-Alongshore | | | 31 | S | | | | | | | 46 | S | | | | | | |
| | Cross-shore | | | 9 | ON | | | | | | | 4 | OF | | | | | | |
| | Resultant | | | 32 | 176 | | | | | | | 46 | 155 | | | | | | |
| 22 | 0700-Alongshore | 76 | S | 26 | S | | | 152 | S | | | 67 | S | 47 | S | | | | |
| | Cross-shore | 23 | On | 6 | ON | 201 | | 38 | On | North | 67 | S | 8 | OF | | | | | |
| | Resultant | 80 | 177 | 27 | 173 | | | 157 | 174 | | | 48 | 150 | | | | | | |
| 22 | 1300-Alongshore | | | 28 | S | | | | | | | 46 | S | | | | | | |
| | Cross-shore | | | 8 | ON | | | | | | | 6 | OF | | | | | | |
| | Resultant | | | 29 | 176 | | | | | | | 46 | 153 | | | | | | |
| 22 | 1900-Alongshore | | | 16 | S | | | | | | | 30 | S | | | | | | |
| | Cross-shore | | | 7 | ON | | | | | | | 1 | OF | | | | | | |
| | Resultant | | | 17 | 184 | | | | | | | 30 | 152 | | | | | | |
| 23 | 0100-Alongshore | | | 18 | S | | | | | | | 6 | S | | | | | | |
| | Cross-shore | | | 0 | | | | | | | | 2 | OF | | | | | | |
| | Resultant | | | 18 | 160 | | | | | | | 11 | 104 | | | | | | |
| 23 | 0700-Alongshore | 61 | S | 11 | S | | | 68 | S | | | 19 | S | | | | | | |
| | Cross-shore | 15 | On | 5 | OF | 164 | | 0 | 0 | North | 8 | N | 7 | OF | | | | | |
| | Resultant | 63 | 174 | 12 | 136 | | | 68 | 160 | | | 20 | 140 | | | | | | |
| 23 | 1300-Alongshore | | | 16 | S | | | | | | | 20 | S | | | | | | |
| | Cross-shore | | | 7 | OF | | | | | | | 6 | OF | | | | | | |
| | Resultant | | | 17 | 136 | | | | | | | 21 | 143 | | | | | | |
| 23 | 1900-Alongshore | | | 7 | S | | | | | | | 10 | S | | | | | | |
| | Cross-shore | | | 3 | OF | | | | | | | 9 | OF | | | | | | |
| | Resultant | | | 8 | 137 | | | | | | | 13 | 118 | | | | | | |
| 24 | 0100-Alongshore | | | 1 | S | | | | | | | 4 | N | | | | | | |
| | Cross-shore | | | 8 | OF | | | | | | | 4 | OF | | | | | | |
| | Resultant | | | 8 | 77 | | | | | | | 6 | 25 | | | | | | |
| 24 | 0700-Alongshore | 10 | S | 1 | N | | | 29 | N | | | 6 | N | | | | | | |
| | Cross-shore | 0 | 0 | 2 | OF | 164 | | 6 | Off | South | 21 | N | 4 | OF | | | | | |
| | Resultant | 10 | 160 | 2 | 43 | | | 30 | 351 | | | 7 | 14 | | | | | | |
| 24 | 1300-Alongshore | | | 11 | S | | | | | | | 4 | S | | | | | | |
| | Cross-shore | | | 14 | OF | | | | | | | 17 | OF | | | | | | |
| | Resultant | | | 18 | 108 | | | | | | | 12 | 82 | | | | | | |
| 24 | 1900-Alongshore | | | 8 | S | | | | | | | 11 | S | | | | | | |
| | Cross-shore | | | 1 | OF | | | | | | | 6 | OF | | | | | | |
| | Resultant | | | 8 | 153 | | | | | | | 13 | 131 | | | | | | |

KEY = ALL SPEEDS IN CM/SEC
 N =NORTHWARD, SHORE PARALLEL
 S =SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

| PIER MEASUREMENTS | | | | | | | | BEACH MEASUREMENTS (500 UPDRIFT) | | | | | | | |
|--------------------|-----------------|---|-----|----------------------|-----------|----------|---------------------------|-------------------------------------|------------------------------------|-----------------|-----------|-----|--|--|--|
| | DYE AT | CURRENT METER | | DYE AT MID SURF ZONE | (SURFACE) | | DIST. FROM | | DYE | CURRENT METER | | | | | |
| | 19400 (579m) | AT 14120 (433m) I.D. #639 (SURFACE) | | (DEPTH - 4.2m MSL) | (SURFACE) | | 12M OFFSHORE (SURFACE) | | 12M OFFSHORE (DEPTH - 4.8m MSL) | AT SOUTH TRIPOD | I.D. #679 | | | | |
| TIME | SPEED DIR | SPEED | DIR | BASELINE(M) | SPEED DIR | LOCATION | SPEED DIR | SPEED | DIR | SPEED | DIR | | | | |
| 25 0100-Alongshore | | 8 | S | | | | | | | | | | | | |
| Cross-shore | | 13 | OF | | | | | | | 6 | OF | | | | |
| Resultant | | 15 | 102 | | | | | | | 11 | 126 | | | | |
| 25 0700-Alongshore | 12 S | 6 | S | | | | | | | 17 N | 14 | S | | | |
| Cross-shore | 0 0 | 1 | ON | 164 | 9 S | North | 10 | 160 | 4 Off | | 8 | OF | | | |
| Resultant | 12 160 | 6 | 169 | | | | | | | | 16 | 130 | | | |
| 25 1300-Alongshore | | 8 | S | | | | | | | | 4 | S | | | |
| Cross-shore | | 8 | OF | | | | | | | | 6 | OF | | | |
| Resultant | | 11 | 115 | | | | | | | | 7 | 104 | | | |
| 25 1900-Alongshore | | 2 | S | | | | | | | | 12 | S | | | |
| Cross-shore | | 1 | OF | | | | | | | | 5 | OF | | | |
| Resultant | | 2 | 133 | | | | | | | | 13 | 132 | | | |
| 26 0100-Alongshore | | 8 | S | | | | | | | | 9 | S | | | |
| Cross-shore | | 7 | OF | | | | | | | | 8 | OF | | | |
| Resultant | | 11 | 119 | | | | | | | | 12 | 118 | | | |
| 26 0700-Alongshore | 44 S | 13 | S | | | | | | | | 20 | S | | | |
| Cross-shore | 9 On | 6 | OF | 164 | 24 N | | | | | | 13 | OF | | | |
| Resultant | 44 171 | 14 | 135 | | | | | | | | 24 | 127 | | | |
| 26 1300-Alongshore | | 22 | S | | | | | | | | 5 | S | | | |
| Cross-shore | | 14 | OF | | | | | | | | 6 | OF | | | |
| Resultant | | 26 | 129 | | | | | | | | 8 | 110 | | | |
| 26 1900-Alongshore | | 2 | S | | | | | | | | 3 | S | | | |
| Cross-shore | | 1 | OF | | | | | | | | 3 | OF | | | |
| Resultant | | 2 | 133 | | | | | | | | 4 | 115 | | | |
| 27 0100-Alongshore | | 1 | S | | | | | | | | 1 | N | | | |
| Cross-shore | | 2 | OF | | | | | | | | 4 | OF | | | |
| Resultant | | 2 | 97 | | | | | | | | 4 | 56 | | | |
| 27 0700-Alongshore | 12 N | 6 | N | | | | | | | | 20 | N | | | |
| Cross-shore | 12 Off | 3 | OF | 163 | 51 N | | | | | | 3 | OF | | | |
| Resultant | 18 25 | 7 | 2 | | 13 | Off | 64 N | | | | 20 | 349 | | | |
| 27 1300-Alongshore | | 6 | N | | | | | | | | 10 | N | | | |
| Cross-shore | | 3 | OF | | | | | | | | 3 | OF | | | |
| Resultant | | 7 | 2 | | | | | | | | 10 | 352 | | | |
| 27 1900-Alongshore | | 9 | N | | | | | | | | 15 | N | | | |
| Cross-shore | | 7 | OF | | | | | | | | 7 | OF | | | |
| Resultant | | 11 | 18 | | | | | | | | 17 | 5 | | | |
| 28 0100-Alongshore | | 2 | N | | | | | | | | 3 | N | | | |
| Cross-shore | | 4 | OF | | | | | | | | 12 | OF | | | |
| Resultant | | 4 | 43 | | | | | | | | 12 | 56 | | | |
| 28 0700-Alongshore | 44 S | 11 | S | | | | | | | | 16 | S | | | |
| Cross-shore | 7 On | 1 | OF | 229 | 51 S | | | | | | 8 | OF | | | |
| Resultant | 44 169 | 11 | 155 | | | | | | | | 18 | 133 | | | |
| 28 1300-Alongshore | | 12 | S | | | | | | | | 23 | S | | | |
| Cross-shore | | 3 | OF | | | | | | | | 2 | OF | | | |
| Resultant | | 12 | 146 | | | | | | | | 25 | 132 | | | |
| 28 1900-Alongshore | | 14 | S | | | | | | | | 9 | S | | | |
| Cross-shore | | 5 | OF | | | | | | | | 17 | OF | | | |
| Resultant | | 15 | 140 | | | | | | | | 19 | 98 | | | |
| 29 0100-Alongshore | | 12 | S | | | | | | | | 12 | S | | | |
| Cross-shore | | 7 | OF | | | | | | | | 14 | OF | | | |
| Resultant | | 14 | 130 | | | | | | | | 18 | 111 | | | |
| 29 0700-Alongshore | 0 0 | 2 | S | | | | | | | | 2 | OF | | | |
| Cross-shore | 9 On | 4 | OF | 187 | 38 N | | | | | | 11 | N | | | |
| Resultant | 9 250 | 4 | 27 | | 4 | On | 48 N | | | | 4 | 350 | | | |
| 29 1300-Alongshore | | 1 | S | | | | | | | | 13 | OF | | | |
| Cross-shore | | 1 | OF | | | | | | | | 14 | 53 | | | |
| Resultant | | 1 | 115 | | | | | | | | 7 | N | | | |
| 29 1900-Alongshore | | 0 | N | | | | | | | | 4 | OF | | | |
| Cross-shore | | 2 | OF | | | | | | | | 4 | OF | | | |
| Resultant | | 2 | 70 | | | | | | | | 8 | 10 | | | |
| 30 0100-Alongshore | | 2 | S | | | | | | | | 6 | N | | | |
| Cross-shore | | 0 | | | | | | | | | 10 | OF | | | |
| Resultant | | 2 | 160 | | | | | | | | 12 | 39 | | | |
| 30 0700-Alongshore | 24 N | 1 | S | | | | | | | | 2 | N | | | |
| Cross-shore | 6 Off | 2 | OF | 177 | 51 N | | | | | | 8 | OF | | | |
| Resultant | 25 354 | 2 | 27 | | 30 Off | | | | | | 8 | 56 | | | |
| 30 1300-Alongshore | | 0 | S | | | | | | | | 7 | OF | | | |
| Cross-shore | | 3 | OF | | | | | | | | 8 | N | | | |
| Resultant | | 3 | 70 | | | | | | | | 12 | 28 | | | |
| 30 1900-Alongshore | | 0 | S | | | | | | | | 16 | N | | | |
| Cross-shore | | 4 | OF | | | | | | | | 3 | OF | | | |
| Resultant | | 4 | 70 | | | | | | | | 16 | 351 | | | |
| 31 0100-Alongshore | | 1 | S | | | | | | | | 2 | N | | | |
| Cross-shore | | 1 | OF | | | | | | | | 7 | OF | | | |
| Resultant | | 1 | 115 | | | | | | | | 7 | 54 | | | |
| 31 0700-Alongshore | 21 N | 1 | S | | | | | | | | 4 | OF | | | |
| Cross-shore | 11 Off | 2 | OF | 189 | 55 N | | | | | | 10 | 4 | | | |
| Resultant | 24 7 | 2 | 27 | | 14 Off | | | | | | 0 | 4 | | | |
| 31 1300-Alongshore | | 1 | S | | | | | | | | 10 | OF | | | |
| Cross-shore | | 4 | OF | | | | | | | | 10 | OF | | | |
| Resultant | | 4 | 84 | | | | | | | | 12 | 70 | | | |
| 31 1900-Alongshore | | 0 | S | | | | | | | | 1 | N | | | |
| Cross-shore | | 3 | OF | | | | | | | | 5 | OF | | | |
| Resultant | | 3 | 70 | | | | | | | | 5 | 52 | | | |

KEY = ALL SPEEDS IN CM/SEC
 N =NORTHWARD, SHORE PARALLEL
 S =SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

V. SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) taken at the seaward end of the pier are made of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves) but not surface chop or capillary waves. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring alignment of the wave crests. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 east of true north; consequently, wave angles greater than 70 imply the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are made daily at the seaward end of the FRF pier. A jar along with a thermometer is lowered about .3 m (1 ft) into the water and allowed to remain for at least one minute. The jar is removed, the temperature read and a hydrometer is used to determine the density. A secci disc is used to determine the surface visibility.

Table 5

SUPPLEMENTAL OBSERVATIONS

March 1986

| DAY/TIME | WAVE APPROACH ANGLE AT PIER END (° from True N) | | RADAR WAVE ANGLE (° from True N) | WIDTH OF SURF ZONE(M) | WATER CHARACTERISTICS AT PIER END | | |
|----------|---|-----------|--|--------------------------|--------------------------------------|-----------------|-----|
| | PRIMARY | SECONDARY | | | DENSITY (g/cc) | SECCI VIS(M) | |
| 1 0830 | 40 | | 50 | 158 | 4.0 | 1.0218 | 1.5 |
| 2 0815 | 40 | | 60 | 167 | 3.5 | 1.0210 | 1.5 |
| 3 0825 | 80 | | 90 | 146 | 4.3 | 1.0230 | 0.9 |
| 4 0810 | 80 | | 80 | 115 | 4.1 | 1.0218 | 3.0 |
| 5 0817 | 40 | | | 116 | 4.5 | 1.0211 | 2.4 |
| 6 0800 | | | | 106 | 4.9 | 1.0224 | 3.0 |
| 7 0800 | 90 | | | 61 | 4.5 | 1.0252 | 1.8 |
| 8 0830 | 40 | 60 | 60 | 192 | 3.5 | 1.0256 | 0.9 |
| 9 0820 | 90 | | | 70 | 3.8 | 1.0248 | 1.7 |
| 10 0805 | 100 | | | 0 | 5.3 | 1.0260 | 3.3 |
| 11 0755 | 100 | | 90 | 38 | 6.3 | 1.0260 | 3.3 |
| 12 0755 | 40 | | 50 | 149 | 5.5 | 1.0258 | 3.3 |
| 13 0755 | 80 | | 80 | 133 | 6.0 | 1.0258 | 5.5 |
| 14 0735 | 120 | | | 32 | 6.6 | 1.0242 | 3.6 |
| 15 0850 | 100 | | | 12 | 6.2 | 1.0252 | 2.1 |
| 16 0920 | 125 | | | 9 | 6.4 | 1.0261 | 4.0 |
| 17 0630 | 45 | | | 103 | 7.5 | 1.0202 | 3.3 |
| 18 0805 | 50 | 80 | 60 | 94 | 7.4 | 1.0202 | 2.4 |
| 19 0825 | 110 | 100 | 100 | 141 | 7.4 | 1.0243 | 1.8 |
| 20 0805 | 100 | | 90 | 125 | 6.9 | 1.0259 | 3.3 |
| 21 0910 | 45 | | 50 | 372 | 6.8 | 1.0207 | 0.9 |
| 22 0840 | 50 | | 60 | 286 | 6.6 | 1.0186 | 0.9 |
| 23 0825 | 80 | | 80 | 195 | 6.5 | 1.0200 | 0.9 |
| 24 0815 | 80 | | 80 | 162 | 6.8 | 1.0232 | 2.1 |
| 25 0730 | 80 | | 80 | 154 | 7.8 | 1.0220 | 3.0 |
| 26 0710 | 100 | | 80 | 136 | 8.7 | 1.0209 | 2.1 |
| 27 0730 | 120 | | | 100 | 8.3 | 1.0227 | 3.3 |
| 28 0800 | 60 | 20 | 80 | 164 | 9.6 | 1.0215 | 1.8 |
| 29 0800 | 105 | 360 | | 143 | 9.6 | 1.0205 | 4.3 |
| 30 0810 | 130 | 50 | | 122 | 10.4 | 1.0206 | 4.3 |
| 31 0630 | 115 | | | 110 | 7.5 | 1.0246 | 2.4 |

VI. WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865- 1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the range of each cycle while Figure 5 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours), and contains a list of selected mean and extreme values. This presentation is useful in identifying effects on both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

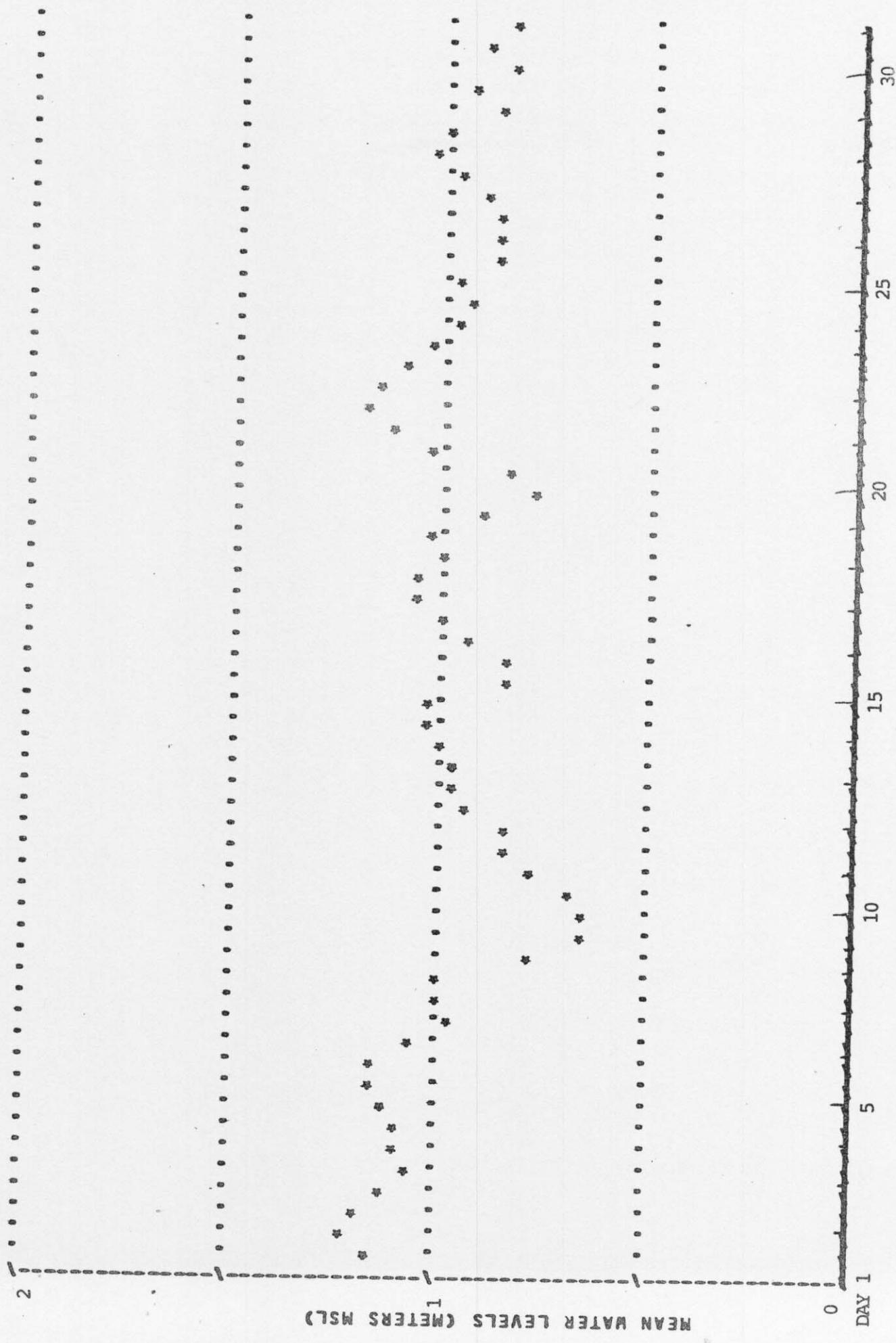


FIGURE 4. Time History of Tide Range, March 1986 (Gage No. 865-1370)

FRF TIDE HEIGHTS

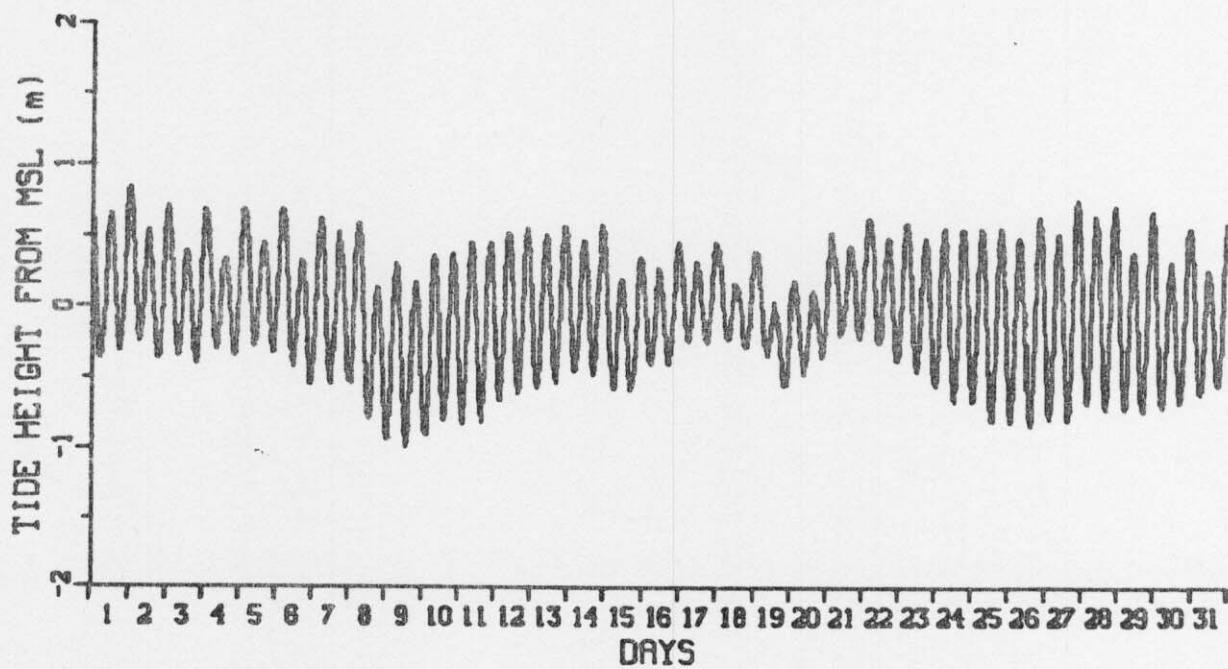


FIGURE 5. Time History of Mean Water Levels, March 1986 (Gage No. 865-1370)

MONTHLY MEAN WATER LEVELS (METERS MSL)

| | |
|-------------------|------------------------------|
| Extreme Low - | -.99 on 9 March at 1224 hrs. |
| Extreme High - | .85 on 1 March at 2330 hrs. |
| Monthly Mean - | -.03 |
| Mean Low Water | -.54 |
| Mean High Water - | .52 |
| Mean Range - | 1.06 |

| MID-CYCLE DAY | LOW | HIGH | MEAN | RANGE |
|------------------|-----|------|------|-------|
|------------------|-----|------|------|-------|

TABLE 6

WATER LEVELS (METERS MSL)
Tidal Characteristics

March 1986

| | | | | | |
|----|------|------|-----|------|------|
| 1 | 612 | -.37 | .66 | .16 | 1.02 |
| 1 | 1837 | -.32 | .85 | .22 | 1.17 |
| 2 | 702 | -.24 | .69 | .20 | .92 |
| 2 | 1928 | -.36 | .71 | .12 | 1.07 |
| 3 | 753 | -.34 | .59 | .07 | .94 |
| 3 | 2018 | -.40 | .69 | .10 | 1.09 |
| 4 | 843 | -.30 | .61 | .09 | .91 |
| 4 | 2108 | -.35 | .69 | .12 | 1.04 |
| 5 | 934 | -.28 | .66 | .16 | .94 |
| 5 | 2159 | -.33 | .69 | .15 | 1.01 |
| 6 | 1024 | -.42 | .66 | .05 | 1.08 |
| 6 | 2249 | -.55 | .62 | -.02 | 1.17 |
| 7 | 1114 | -.54 | .62 | .01 | 1.16 |
| 7 | 2340 | -.54 | .59 | .01 | 1.12 |
| 8 | 1205 | -.79 | .57 | -.20 | 1.36 |
| 9 | 30 | -.94 | .31 | -.35 | 1.25 |
| 9 | 1255 | -.99 | .28 | -.36 | 1.27 |
| 10 | 120 | -.90 | .37 | -.31 | 1.27 |
| 10 | 1346 | -.80 | .38 | -.21 | 1.10 |
| 11 | 211 | -.83 | .45 | -.17 | 1.28 |
| 11 | 1436 | -.81 | .45 | -.15 | 1.26 |
| 12 | 301 | -.66 | .52 | -.07 | 1.18 |
| 12 | 1526 | -.61 | .55 | -.03 | 1.16 |
| 13 | 352 | -.56 | .51 | -.02 | 1.07 |
| 13 | 1617 | -.53 | .57 | .01 | 1.09 |
| 14 | 442 | -.45 | .47 | .03 | .92 |
| 14 | 1707 | -.48 | .57 | .05 | 1.05 |
| 15 | 532 | -.57 | .40 | -.15 | .97 |
| 15 | 1758 | -.59 | .35 | -.15 | .94 |
| 16 | 623 | -.40 | .27 | -.07 | .67 |
| 16 | 1848 | -.40 | .45 | -.01 | .86 |
| 17 | 713 | -.24 | .31 | .05 | .56 |
| 17 | 1938 | -.25 | .45 | .08 | .70 |
| 18 | 804 | -.23 | .30 | -.00 | .52 |
| 18 | 2029 | -.29 | .40 | .03 | .69 |
| 19 | 854 | -.34 | .32 | -.10 | .66 |
| 19 | 2119 | -.56 | .19 | -.23 | .75 |
| 20 | 944 | -.47 | .12 | -.17 | .59 |
| 20 | 2210 | -.35 | .52 | .02 | .87 |
| 21 | 1035 | -.20 | .43 | .13 | .63 |
| 21 | 2300 | -.22 | .62 | .18 | .84 |
| 22 | 1125 | -.26 | .57 | .15 | .82 |
| 22 | 2350 | -.38 | .59 | .09 | .97 |
| 23 | 1216 | -.45 | .53 | .04 | .98 |
| 24 | 41 | -.55 | .55 | -.02 | 1.10 |
| 24 | 1306 | -.66 | .55 | -.05 | 1.21 |
| 25 | 131 | -.66 | .56 | -.04 | 1.22 |
| 25 | 1356 | -.80 | .56 | -.12 | 1.36 |
| 26 | 222 | -.81 | .49 | -.13 | 1.30 |
| 26 | 1447 | -.83 | .63 | -.11 | 1.46 |
| 27 | 312 | -.79 | .52 | -.10 | 1.31 |
| 27 | 1537 | -.80 | .75 | -.04 | 1.55 |
| 28 | 402 | -.68 | .64 | .02 | 1.33 |
| 28 | 1628 | -.72 | .70 | -.01 | 1.42 |
| 29 | 453 | -.73 | .52 | -.12 | 1.25 |
| 29 | 1718 | -.73 | .68 | -.08 | 1.41 |
| 30 | 543 | -.71 | .49 | -.15 | 1.20 |
| 30 | 1808 | -.68 | .56 | -.10 | 1.23 |
| 31 | 634 | -.62 | .46 | -.14 | 1.07 |

VII. NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 6 shows the last survey in February and the two surveys taken during March on profile line 188, located 517 m south of the pier. A significant amount of erosion (up to 0.75 m) in the nearshore (100 to 200 m) with corresponding accretion (0.5 m) on the storm bar (200 to 320 m) is visible following the first survey in March. The profile continued to change with the development of a distinct nearshore bar and trough (120 to 190 m) and further accretion (up to 1.0 m) on the storm bar. In addition, some minor erosion on the foreshore (60 to 100 m) visible on the first survey had by the end of the month been replaced. Only minor changes are visible on the remainder of the profile.

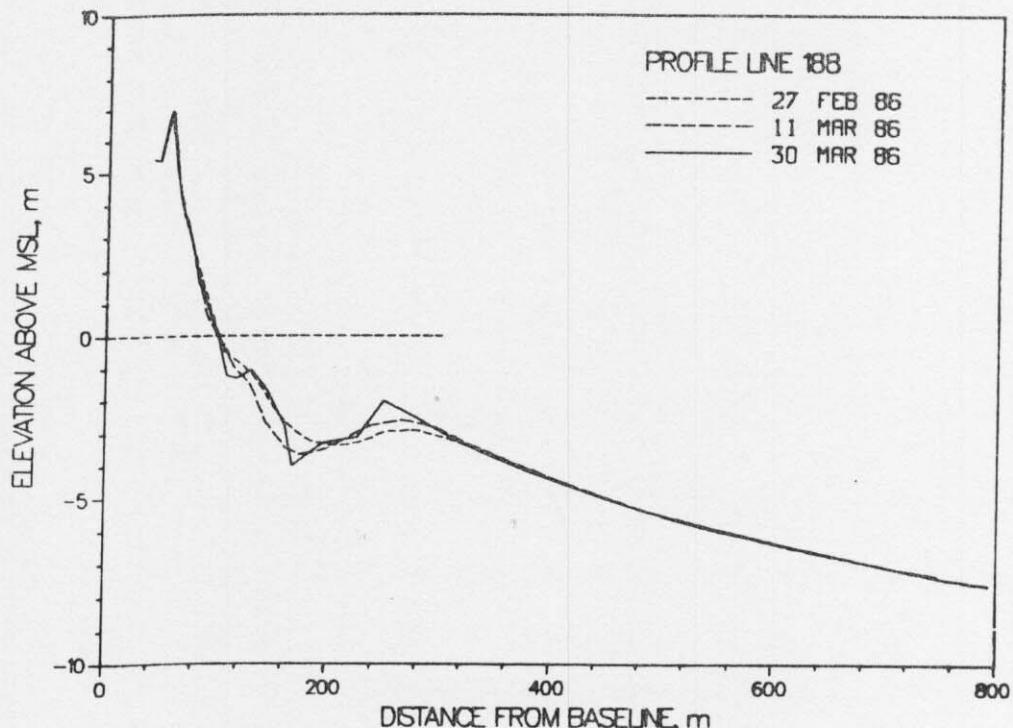


Figure 6. Monthly CRAB profiles on profile 188 - 517 meters south of pier.

The profile envelope (Figure 7) reflects the maximum changes which occurred on the profile during March. The deep trough (160 to 200 m) and the accretion on the storm bar (220 to 320 m) were both visible on the last survey in March.

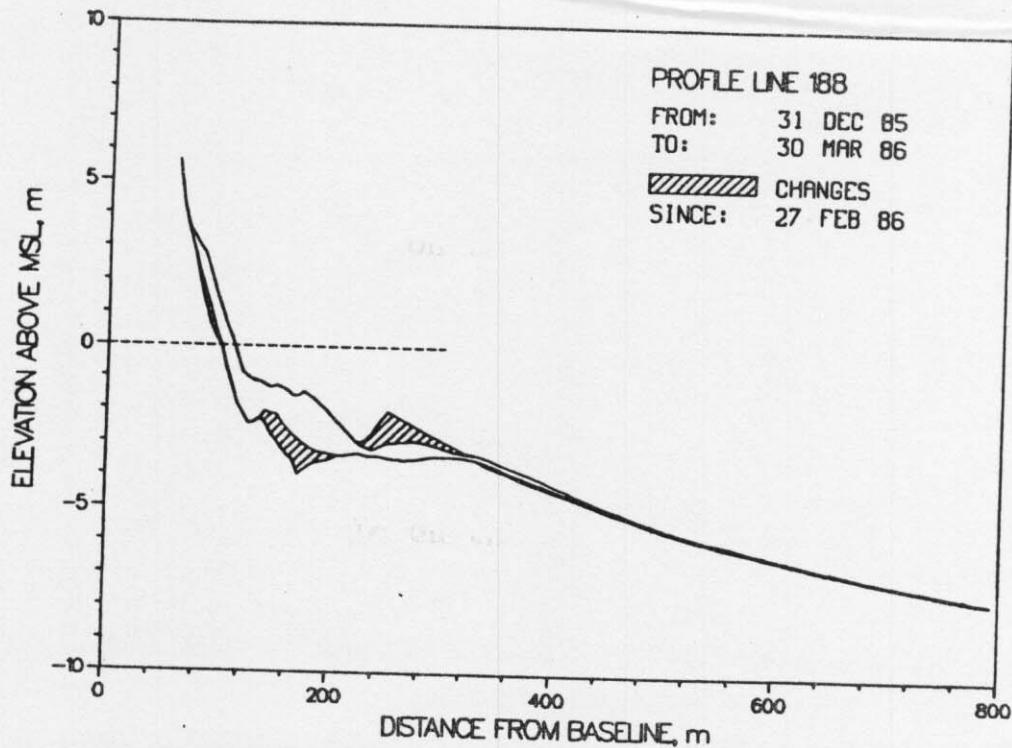


Figure 7. CRAB profile envelope - profile 188.

B. Bathymetry. No bathymetric survey was conducted in March. The last survey, 28 February 1986, is included for reference.

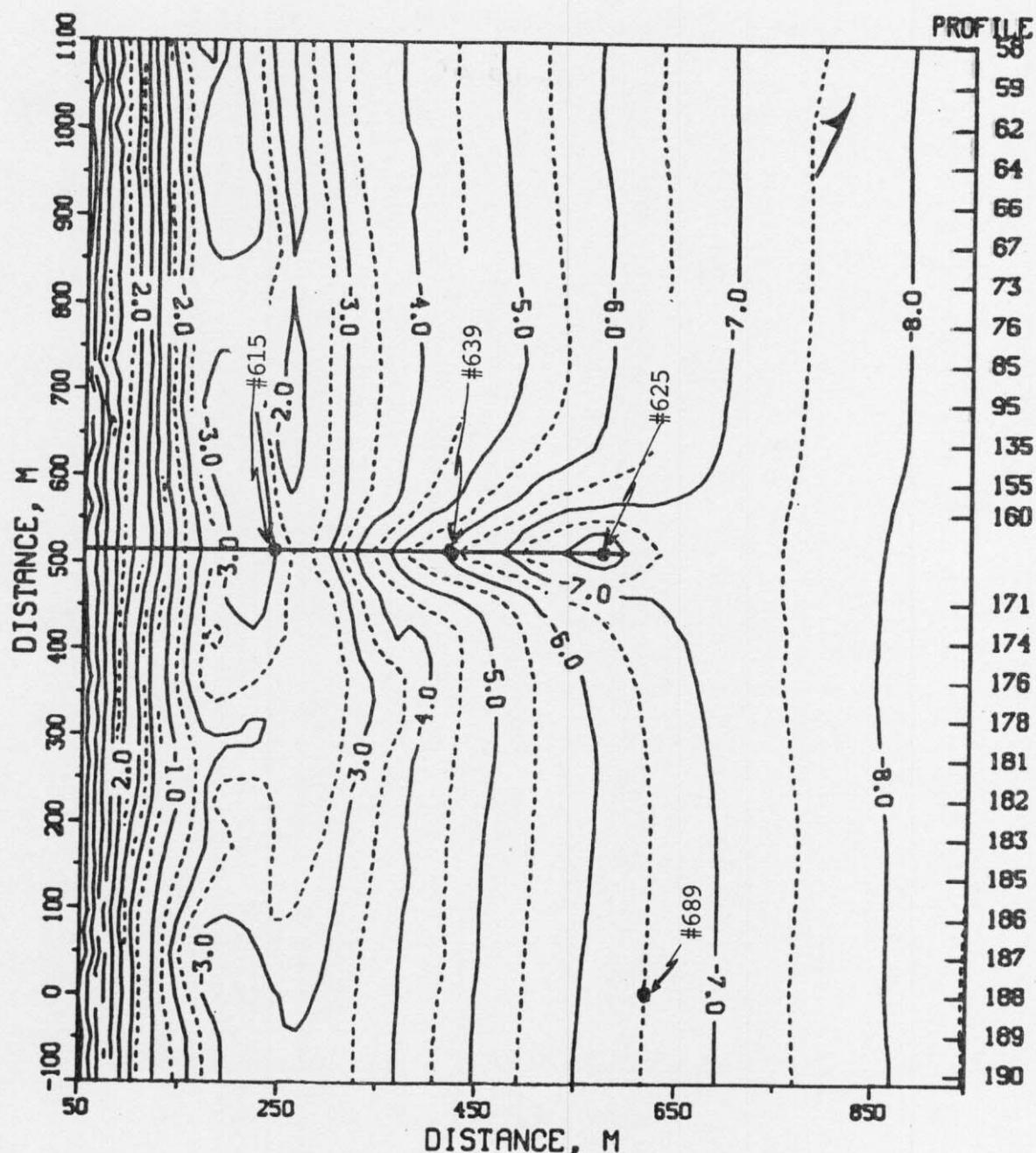


FIGURE 8. FRF BATHYMETRY 28 FEB 86
CONTOURS IN METERS

VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the wave height at the seaward end of the pier (i.e. as measured by the Baylor gage #625 at pier station 19+00) exceeded 2 m and wave records were obtained every hour:

| <u>Start</u> | <u>End</u> |
|-----------------|-----------------|
| 7 March (2200) | 8 March (0300) |
| 21 March (0400) | 21 March (1500) |
| 22 March (0700) | 22 March (1300) |

B. Storm Synopsis.

1. 7-8 March 1986 - Late on 7 March, a cold front associated with a strong storm centered over Maine in conjunction with a large high pressure system over North Dakota passed off the North Carolina coast. Strong north winds behind the front generated large waves at the FRF. Winds exceeded 13 m/s (NW) and the maximum Hmo (gage #625) of 2.53 m was recorded at 0200 hours on 8 March.

2. 21-22 March 1986 - Strong NNE winds generated by a large mid-western high pressure system began to buffet the FRF late on 20 March. Winds exceeded 15 m/s (NNE) and the maximum Hmo (gage #625) of 2.53 m was recorded at 0800 hours on 21 March. A total of 20 mm of precipitation was also recorded.

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